State Route 1 Land Use & Transportation Study Technical Appendix

SR1
Land Use & Transportation Study
A joint effort of Sussex County and DelDOT

AUGUST 2003

State Route 1 Land Use & Transportation Study Technical Appendix

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August 2003

STATE ROUTE 1 LAND USE & TRANSPORTATION PLAN
TECHNICAL APPENDIX

Table of Contents

State Route 1 Land Use & Transportation Plan

Appendix I Introduction

Memorandum of Agreement between the Delaware Department of Transportation and Sussex County Council related to the State Route 1 - Land Use/Transportation Study

MEMORANDUM OF AGREEMENT

REGARDING COOPERATIVE AGREEMENT

BETWEEN

THE DELAWARE DEPARTMENT OF TRANSPORTATION

AND THE

SUSSEX COUNTY COUNCIL

RELATED TO THE

STATE ROUTE 1 – LAND USE/TRANSPORTATION STUDY

The purpose of this Memorandum of Agreement ("MOA") between the Delaware Department of Transportation (Department) and the Sussex County Council (County) is to form a basis for jointly developing the **State Route 1 – Land Use /Transportation Study** and the mutual adoption and implementation of its findings. Sussex County is the fastest growing county in Delaware. Therefore, the development of the Sussex County transportation system within the projected land use has become of paramount importance. The recent completion of the concept portion of the State Route 1 Grid Study ("Grid"), the ongoing update of the Sussex County Long-Range Transportation Plan and the Sussex County Comprehensive Plan, reaffirms the Department and County's joint interest.

The State Cabinet Committee on Statewide Planning Issues has recently determined that the area including the SR-1 Grid will become an urban environment. The Sussex County's sewage treatment plants for the districts in the SR-1 Grid area are currently designed and built to accommodate the projected growth as established in the County's 1997 Comprehensive Plan. Unlike incorporated areas, this area does not currently have a plot or plan of an effective street and road network to accommodate the projected transportation needs of the area. This MOA sets forth the framework for the Department and the County to collectively develop, adopt, and implement such a plan.

WHEREAS, the Department has statutory responsibilities to lay out and determine the state highway system outside of municipal boundaries, pursuant to 17 Delaware Code, § 132, to serve as the principle source of transportation planning, design, and construction, and to review and approve access permits on all public roads within its jurisdiction; and

WHEREAS, the County has statutory responsibilities, under Title 9, Part I Chapter 5 and Part IV Chapter 68 of the Delaware Code, to review and approve both commercial and residential site plans and to coordinate with activities and programs of the State; and

WHEREAS, the Sussex County Code Chapter 99 and 115 sets forth the approval process that must contain a circulation element which examines transportation routes, which is to be reviewed by the Department; and

WHEREAS, the draft FY2002-2007 Delaware Department of Transportation Capital Improvement Program includes $25 million dollars over 6 years to plan, design, obtain right-away, and for construction improvements along the SR-1 corridor from Rehoboth Avenue to Five Points in Sussex County, much of which is for projects not yet defined.

WHEREAS, the goal of the **State Route 1 –Land Use /Transportation Study** is to develop a series of three land use projections for the Rehoboth/Lewes area and use these scenarios to assess the travel demands for the area. The study will develop base, high, and low land use scenarios from population and employment forecasts, current land use trends, and current zoning and comprehensive plan guidelines; and

WHEREAS, the Department and the County will use these scenarios to better define the "Grid" system concept previously developed. For each of the three scenarios the "Grid" system will be defined in terms of function, lane requirements and intersection controls. Additional transportation improvements such as public transit services and pedestrian and bicycle facilities will also be defined for each scenario; and

WHEREAS, the transportation improvement requirements for each scenario will be identified and the improvements will be prioritized by the Department and the County for project planning and development; and

WHEREAS, the Parties to this MOA believe that transportation planning and programming must be conducted as an integral part of and consistent with the comprehensive planning and development process, and that the process must involve effective participation by state and local governments, private and special interest, and the general public; and

WHEREAS, this MOA represents a collaborative effort between the Department and the County to effectively address joint interests in the transportation system and land use for the Rehoboth/Lewes area.

THEREFORE, the Department and the County agree that:

1. The Department and County will jointly develop **the State Route 1 –Land Use/Transportation Study** and mutually adopt and implement it's findings into the official Sussex County Comprehensive Plan, zoning maps, and in the development of regulations. The final decision on land use shall be that of the County.
2. The Department and the County will each appoint a representative to jointly lead the development of the State Route 1 – Land Use /Transportation Study.
3. The appointed Department and County representatives will be the liaison to their respective organizations to facilitate communications and share technical information in the development and implementation of the findings of the **State Route 1 –Land Use /Transportation Study.**
4. The Department and the County will jointly hold public information/input meetings on the **State Route 1 –Land Use /Transportation Study** wherein the proposed policies, regulations, and projects will be presented and public participation encouraged. All public meetings will be held within the study area.

5. The Department and the County will jointly establish a Public Advisory Committee (PAC) that will assist in the coordination of planning issues associated with the preparation of **the State Route 1 – Land Use/Transportation Study**. The PAC will be co-chaired by a representative each from the Department and the County.

The Department and the County shall appoint the following members of the PAC:

a. Citizens (5 members, selected jointly by the Department and the County)
b. President of County Council (1 member)
c. The mayors of Rehoboth Beach, Lewes, Dewey Beach, and Henlopen Acres (4 members)

In addition, the following entities shall appoint members to the PAC:

a. Sussex County Planning and Zoning	(1 member)
b. Sussex County Volunteer Fireman's Association	(1 member)
c. Council on Transportation	(1 member)
d. Sussex County Farm Bureau	(1 member)
e. Center for Inland Bays	(1 member)
f. Lewes Chambers of Commerce	(1 member)
g. Rehoboth/Dewey Beach Chambers of Commerce	(1 member)
h. Citizen Coalition	(1 member)
i. West Side New Beginnings	(1 member)
j. Southern Delaware Home Builders Association	(1 member)
k. Sussex County Association of Realtors	(1 member)

The following entities shall appoint technical advisory members to the PAC:

a. Delaware Department of Agriculture	(1 member)
b. Delaware Department of Natural Resources & Environmental Control	(1 member)
c. Sussex County Conservation District	(1 member)
d. Delaware Transit Corporation	(1 member)
e. Delaware River and Bay Authority	(1 member)
f. Office of State Planning	(1 member)
g. Sussex County Economic Development	(1 member)
h. Delaware Historic Preservation Office	(1 member)
i. Sussex County Engineering Department	(1 member)

In addition the following entities shall be included as invitees to all PAC meetings:

a.	State Representative	(1 member)
b.	State Senators	(2 members)
c.	Sussex County Administrator	(1 member)
d.	Secretary of the Department of Transportation	(1 member)
e.	Sussex County Council Representatives for the Study area	(2 members)

6. The Department and the County agree that the State's capacity roads (ie. the roads that are managed to serve through traffic rather than provide access to individual properties) in the "Grid" area should have limited access. The roads needed for regional capacity purposes may have limits on immediate side road access, in order to preserve their capacity for as long as possible.
7. The Department will determine the alignments needed for regional capacity needs in the SR-1 "Grid" area based on the findings of the **State Route 1 –Land Use /Transportation Study**.
8. The Department will commit to a plan for constructing the capacity routes and other improvements, including multimodal improvements such as provisions for bicycle, pedestrian and transit travel, in the same time frame used for the Sussex County Comprehensive Plan and the Sussex County Long-Range Transportation Plan, approximately 20 years.
9. The Department will lead the effort to submit projects into the pipeline to be reviewed by the Project Development Committee, once the alignments are determined (through the **State Route 1 –Land Use /Transportation Study**).
10. The Department's Program Development process of prioritization for capacity road projects will be used to decide the order in which usable segments are built during the 20-year period. This process will take into account the need to promote or take advantage of donations or other developer contributions to meeting these needs; however, the prioritization process will be flexible enough to permit a shift in project priorities in the SR-1 "Grid" area.

11. The Department and the County will continue its interconnection practices/policy wherever possible. Approvals of any land development proposed in the **State Route 1 –Land Use /Transportation Study** ("Grid") area and dedicated to public use will be conditioned upon assuring interconnections between and among other nearby land development. This requirement will assure the provision of connectivity options at the basic level.

12. The County, as the agency responsible for land use, will include the findings of the **State Route 1 –Land Use /Transportation Study** in the Comprehensive Plan update to include the regional capacity routes, to create the necessary reserved areas for the routes and assure the preservation of these alignments during the 20-year period.

13. The Department and the County will adjust the dedication/State acceptance process for connectivity network improvements in the SR-1 Grid area. In an effort to assure the appropriate transportation network will be in place when and where it is needed, it may be preferable for the County Council to adopt a change in their subdivision standards, to requirc any roads in the SR-1 Grid area to be built to State standards.

14. The undersigned recognize the complexity of the transportation planning and programming process and will endeavor to ensure that all personnel involved in their jurisdiction will cooperate fully in carrying out the intent and provisions of this Memorandum of Agreement, and any amendments or additions agreed to by the signatures.

Dale Dukes

President Sussex County Council

4/24/01

Date

Secretary of Transportation

4/10/01

Date

State Route 1 Land Use & Transportation Plan

Appendix II Land Use Scenarios & Travel Conditions

State Route 1 Land Use/Transportation Study

Technical Memorandum

A. Refining Traffic Analysis Zones and Distributing Demographics

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SPLITTING OF TRAFFIC ANALYSIS ZONES AND DISTRIBUTION OF DEMOGRAPHIC ATTRIBUTES TO SPLIT TAZ (POPULATION & EMPLOYMENT)

1. INTRODUCTION:

The purpose of this technical memorandum is to explain the methodologies used for the following tasks:

- Splitting of existing Traffic Analysis Zones (TAZs) in the SR1 study area.
- Distributing employment and population to the split TAZs.

2. SPLITTING OF EXISTING TRAFFIC ANALYSIS ZONES:

The project study area for the SR1 Land Use and Transportation Study (henceforth referred as the 'project study area') lies mainly in three large TAZs (S162, S067 and S188). Some smaller portions of the project study area also lie in three other TAZs (S161, S163 and S064). All these existing TAZs are based on the Sussex County travel model and hence they are fairly large in size. Since the project study area is relatively smaller in size, it is essential to split the existing TAZs into smaller TAZs in order to achieve more accurate outputs from the conventional four-step travel model. The following methodology has been used to split the existing TAZs:

a: The map based on the University of Delaware employment and population database **(see enclosed Map: 1)** shows existing TAZs organized by modified grids. For creating smaller TAZs, these modified grids have been further split based on the land use and zoning. It should be noted that in some cases the split TAZs do not follow the exact boundary of the modified grid. For example, an upper triangular portion of the modified grid 19401140 has been added to the new smaller TAZ 19801160/1.

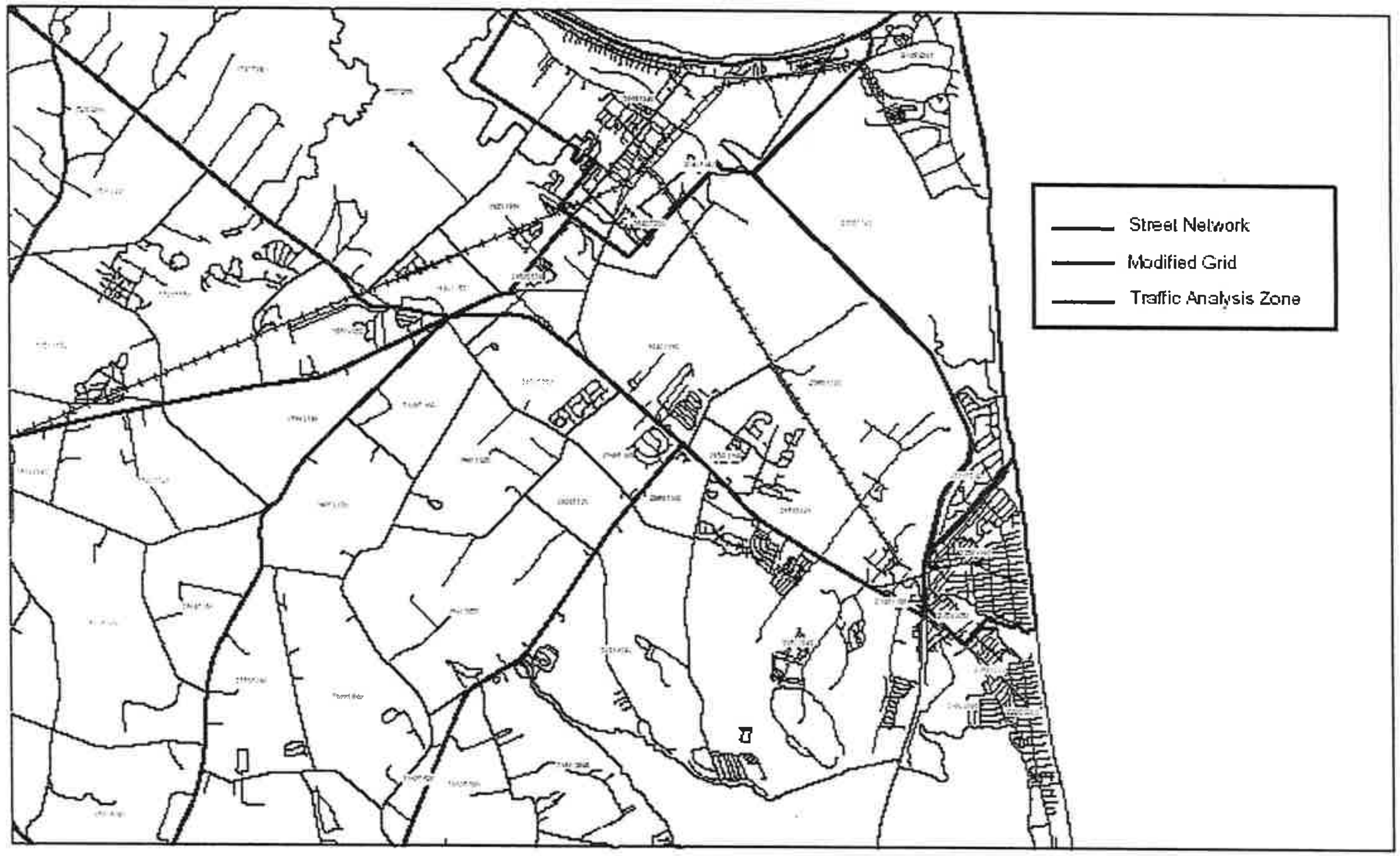
b: Care has been taken to ensure that the newly created split TAZs are not landlocked. Each of the split TAZs has at least one access road. The TAZs are split in such a manner that most of them have a minor arterial or higher classification road as one of the access roads.

c: In most cases, the boundaries of the newly created split TAZs follow physical features like roadways, streams, rail lines etc. In some cases, in absence of an actual physical feature, the boundaries follow imaginary features like a tax parcel boundary.

d: It should be noted that each of the newly created split TAZs lies entirely within the original existing TAZ. In other words, each of the new TAZs does not lie in more than one existing TAZs.

e: The split TAZs have been created in such a way that they separate out commercial and residential establishments as far as possible. Only a few of the newly created TAZs have mixed establishments.

MAP 1:



3. DISTRIBUTION OF EMPLOYMENT AND POPULATION TO THE SPLIT TAZs:

Employment, population and dwelling units by TAZs are the basic inputs to the Sussex County travel model. Hence it is necessary to distribute these attributes associated with the existing TAZs to the newly created split TAZs. Tax parcel maps, which show the existing parcel boundaries, existing zoning and proposed/developing or under construction projects, have been primarily used to distribute employment, dwelling units and population to the newly created TAZs. Aerial photos of the study area have also been used to confirm the land uses shown in the tax parcel maps. The following steps have been used to distribute the employment, dwelling units and population to new TAZs:

Step 1: Consolidation of 10 employment sub-categories into 4 major employment categories (**see Table 1**).

The University of Delaware (UD) employment and population database includes 10 employment sub-categories, whereas the Sussex County travel model uses two major employment categories (manufacturing employment, commercial employment) and total employment. Hence the 10 sub-categories from UD database have been consolidated into 4 major employment categories for base year (2000) as well as future year (2025) as follows:

Manufacturing Employment: includes manufacturing employment subcategory from the UD database.

Industrial Services: which includes construction, TCPU (transportation, communication & public utilities), and wholesale sub-categories from the UD database.

Commercial Employment: which includes FIRE (finance, banks, insurance and real estate), business services, retail trade and public services sub-categories from the UD database.

Community Services: which includes professional services and public administration sub-categories from the UD database.

Table 1 also shows the base as well as future year total employment, dwelling units and population by modified grids.

Table 1
Population and Employment Figures By Grids For SR1 Project Area
Source: University of Delaware Database

TAZ	Modified Grid	INDUS00	MANU00	COMMER00	COMMSER00	TOTAL00	INDUS25	MANU25	COMMER25	COMMSER25	TOTAL25	DU00	DU25	POP00	POP25
S161	18601120	0	0	0	0	**0**	0	0	0	0	**0**	48	54	127	133
S163	18801180	190	0	90	19	**300**	214	0	122	32	**373**	979	1059	2496	2558
S162	19001120	0	0	0	0	**0**	0	0	0	0	**0**	80	129	188	295
S162	19401080	22	0	67	14	**104**	29	0	98	24	**148**	163	173	420	427
S162	19401140	0	0	15	0	**15**	0	0	21	0	**21**	53	60	120	127
S064	19401180	69	2	21	14	**105**	90	2	18	22	**133**	89	461	221	1088
S162	19601120	354	5	322	86	**767**	457	5	455	141	**1051**	188	224	484	562
S162	19801160	42	0	183	1	**226**	55	0	267	2	**319**	224	259	546	603
S067	19801180	179	20	91	318	**607**	233	19	131	518	**882**	305	314	725	717
S064	19801200	65	0	23	24	**111**	83	0	20	39	**143**	643	801	1611	1914
S188	20201040	19	0	9	0	**28**	24	0	15	0	**39**	468	558	1156	1339
S162	20201120	0	0	0	0	**0**	0	0	0	0	**0**	276	353	596	684
S162	20401140	50	0	14	2	**66**	65	0	21	3	**89**	29	33	65	71
S067	20401160	261	19	1376	429	**2085**	338	18	2020	700	**3016**	982	1267	2525	3163
S067	20401220	0	16	14	15	**45**	0	15	12	25	**54**	17	18	38	39
S069	20401240	82	6	265	504	**857**	105	6	395	816	**1285**	540	576	1269	1293
S067	20601120	0	0	0	3	**3**	0	0	0	4	**4**	314	524	867	1414
S188	20601140	14	0	215	14	**244**	18	0	316	24	**351**	54	54	130	125
S188	20801040	276	17	1108	51	**1453**	353	16	1567	84	**2001**	2331	2648	5951	6587
S067	20801120	73	0	392	90	**555**	95	0	579	147	**804**	902	2361	2325	5903
S067	20801140	0	0	56	0	**56**	0	0	65	0	**67**	360	363	901	884
S068	21001141	0	0	0	0	**0**	0	0	0	0	**0**	0	0	0	0
S068	21001142	0	0	41	11	**52**	0	0	45	16	**63**	425	448	1217	1262
S067	21401100	25	16	25	2	**68**	33	15	33	3	**86**	124	131	406	409
S066	21601060	55	0	248	0	**303**	71	0	361	0	**426**	1144	1187	3079	3147
S065	21801080	0	0	25	19	**45**	0	0	34	31	**64**	181	194	434	451
S065	21801100	354	0	2612	110	**3076**	430	0	3784	155	**4313**	2970	3058	7911	8027
TOTAL		**2131**	**103**	**7211**	**1726**	**11171**	**2692**	**97**	**10378**	**2784**	**15731**	**13890**	**17309**	**35808**	**43225**

Step 2: Corrections to the employment, dwelling units and population figures based on the Sussex County tax parcel maps (**see Table 2**).

Employment, dwelling units and population figures for some of the modified grids have been corrected based on the Sussex County tax parcel maps. These corrected figures are shown in blue color in table 2.

1. Corrections to the employment figures have been roughly estimated based on size of employment centers in the modified grids:

Modified Grid # 19401140: commercial employment has been changed from 15 to 115 for base year and from 21 to 121 for future year to include roughly estimated 100 jobs at new Lowe's store.

Modified Grid # 20601120: community service employment has been changed from 3 to 20 for base year and from 4 to 22 for future year to include employment at Wolfeneck Wastewater Treatment Facilities.

The above modifications change the totals for base and future year commercial employment, community service and total employment.

2. Corrections to the dwelling unit figures have been calculated by counting the number of lots in the existing subdivisions and total number of scattered single-family housing for each of the modified grids. Also, future year dwelling units have been corrected for some of the modified grids based on the size of proposed residential establishments marked on the tax parcel maps.

For example:

Modified Grid # 19401140

Existing dwelling units (DU00) from the UD database: 53

Corrected existing dwelling units: 151
(existing Sea-Wood single family subdivision of 56 lots + existing Gosling Creek single family subdivision of 95 lots)

Future year dwelling units (DU25) from UD database: 60

Corrected future year dwelling units: 627
(existing 151 lots + proposed multi-family residential and commercial subdivision of Henlopen Landing; Area 119 acre; 4DU/acre, thus 119 x 4 = 476 DUs)

Table 2

Corrected Population and Employment Figures Based On Sussex County Tax Parcel Maps

TAZ	Modified Grid	INDUS00	MANU00	COMMER00	COMMSER00	TOTAL00	INDUS25	MANU25	COMMER25	COMMSER25	TOTAL25	DU00	DU25	POP00	POP25
S161	18601120	0	0	0	0	**0**	0	0	0	0	**0**	48	54	127	133
S163	18801180	190	0	90	19	**300**	214	0	122	32	**373**	**867**	**880**	**2210**	**2126**
S162	19001120	0	0	0	0	**0**	0	0	0	0	**0**	80	129	188	295
S162	19401080	22	0	67	14	**104**	29	0	98	24	**148**	163	173	420	427
S162	19401140	0	0	**115**	0	**115**	0	0	**121**	0	**121**	**151**	**627**	**342**	**1327**
S064	19401180	69	2	21	14	**105**	90	2	18	22	**133**	89	461	221	1088
S162	19601120	354	5	322	86	**767**	457	5	455	141	**1051**	188	224	484	562
S162	19801160	42	0	183	1	**226**	55	0	267	2	**319**	**1090**	**1120**	**2656**	**2607**
S067	19801180	179	20	91	318	**607**	233	19	131	518	**882**	305	314	725	717
S064	19801200	65	0	23	24	**111**	83	0	20	39	**143**	643	801	1611	1914
S188	20201040	19	0	9	0	**28**	24	0	15	0	**39**	**572**	**600**	**1413**	**1440**
S162	20201120	0	0	0	0	**0**	0	0	0	0	**0**	**29**	**33**	**65**	**71**
S162	20401140	50	0	14	2	**66**	65	0	21	3	**89**	**183**	**456**	**395**	**884**
S067	20401160	261	19	1376	429	**2085**	338	18	2020	700	**3016**	**787**	**1043**	**2024**	**2604**
S067	20401220	0	16	14	15	**45**	0	15	12	25	**54**	17	18	38	39
S069	20401240	82	6	265	504	**857**	105	6	395	816	**1285**	540	576	1269	1293
S067	20601120	0	0	0	**20**	**20**	0	0	0	**22**	**22**	**498**	**563**	**1375**	**1519**
S188	20601140	14	0	215	14	**244**	18	0	316	24	**351**	**150**	**150**	**361**	**347**
S188	20801040	276	17	1108	51	**1453**	353	16	1567	84	**2001**	**3668**	**3956**	**9364**	**9840**
S067	20801120	73	0	392	90	**555**	95	0	579	147	**804**	**659**	**675**	**1699**	**1688**
S067	20801140	0	0	56	0	**56**	0	0	65	0	**67**	**390**	**395**	**976**	**962**
S068	21001141	0	0	0	0	**0**	0	0	0	0	**0**	0	0	0	0
S068	21001142	0	0	41	11	**52**	0	0	45	16	**63**	425	448	1217	1262
S067	21401100	25	16	25	2	**68**	33	15	33	3	**86**	124	131	406	409
S066	21601060	55	0	248	0	**303**	71	0	361	0	**426**	1144	1187	3079	3147
S065	21801080	0	0	25	19	**45**	0	0	34	31	**64**	181	194	434	451
S065	21801100	354	0	2612	110	**3076**	430	0	3784	155	**4313**	2970	3058	7911	8027
TOTAL		**2131**	**103**	**7311**	**1744**	**11288**	**2692**	**97**	**10478**	**2802**	**15849**	**15961**	**18266**	**41010**	**45181**

Note: Corrected Figures are shown in blue. Please see the text for the explanation of the corrections applied based on the Sussex County Tax Parcel Maps.

3. Corrections to population figures have been calculated by multiplying the corrected dwelling units number by the population per dwelling unit ratio from the UD database for each modified grid.

For example:

Modified Grid # 19401140

DU00 from University of Delaware database: 53
POP00 from University of Delaware database: 120

Thus, POP00 / DU00 = 120 / 53
= 2.264

Hence, corrected existing population = corrected dwelling units number x 2.264
= 151 x 2.264
= 342

DU25 from University of Delaware database: 60
POP00 from University of Delaware database: 127

Thus, POP00 / DU00 = 127 / 60
= 2.116

Hence, corrected existing population = corrected dwelling units number x 2.264
= 627 x 2.116
= 1327

Following table shows the changes in the attribute totals due to corrections for the project study area for base as well as future year:

	From UD database	**After Corrections**	**Change**
Total existing employment (TOTAL00)	11,171	11,288	+117
Total future employment (TOTAL25)	15,731	15,849	+118
Total existing dwelling units (DU00)	13,890	15,961	+2,071
Total future dwelling units (DU25)	17,309	18,266	+957
Total existing population (POP00)	35,808	41,010	+5,202
Total future population (POP25)	43,225	45,181	+1,956

<u>Step 3:</u> Distributing employment, dwelling units and population to the smaller newly created TAZs (**see Table 3**).

Employment, dwelling units and population for both the base and future year have been distributed to the newly created TAZs based on the zoning for each TAZ and by the establishments marked on the tax parcel map / aerial photos.

For example:

Modified grid # 20401140 has been split into two new TAZs 20401140/1 (Commercial establishments) and 20401140/2 (residential establishments). Thus, new TAZ 20401140/1 does not have any dwelling units or population and new TAZ 20401140/2 does not have any employment.

It should be noted that newly split TAZs do not necessarily exactly match with the original modified grid and hence employment and population totals for some of the new TAZs differ from that of original modified grid. All these attribute cells have been highlighted in Table 3.

For example:

Base year commercial employment for modified grids 19401140 and 19801160 are 115 and 183 respectively. But commercial employment for newly created TAZs 19401140/2 and 19801160/1 are 15 and 283 respectively. That is because some commercial establishments from 19401140 have been annexed to 19801160, which has resulted in a shift of 100 commercial jobs to the latter TAZ.

Similar shifting of employment, population and dwelling units have been done in two other pairs of modified grids (20601140 & 20801040 and 20801120 & 20801140).

Table 3

Distribution of Population and Employment by Split TAZs for SR1 Project Area

TAZ	Modified Grid	INDUS00	MANU00	COMMER00	COMMSER00	TOTAL00	INDUS25	MANU25	COMMER25	COMMSER25	TOTAL25	DU00	DU25	POP00	POP25
S161	18601120	0	0	0	0	0	0	0	0	0	0	48	54	127	133
	18601120/1	0	0	0	0	0	0	0	0	0	0	34	34	90	84
	18601120/2	0	0	0	0	0	0	0	0	0	0	14	20	37	49
S163	18801180	190	0	90	19	300	214	0	122	32	373	867	880	2210	2126
	18801180/1	150	0	90	19	260	162	0	122	32	321	30	35	76	85
	18801180/2	40	0	0	0	40	52	0	0	0	52	837	845	2134	2041
S162	19001120	0	0	0	0	0	0	0	0	0	0	80	129	188	295
	19001120	0	0	0	0	0	0	0	0	0	0	80	129	188	295
S162	19401080	22	0	67	14	104	29	0	98	24	148	163	173	420	427
	19401080/1	0	0	30	7	38	0	0	50	14	64	123	128	317	316
	19401080/2	22	0	37	7	66	29	0	48	10	84	40	45	103	111
S162	19401140	0	0	115	0	115	0	0	121	0	121	151	627	342	1327
	19401140/1	0	0	0	0	0	0	0	0	0	0	151	627	342	1327
	19401140/2	0	0	15	0	15	0	0	21	0	21	0	0	0	0
S064	19401180	69	2	21	14	105	90	2	18	22	133	89	461	221	1088
	19401180/1	0	2	21	7	30	0	2	18	12	32	40	40	100	94
	19401180/2	69	0	0	7	75	90	0	0	10	101	49	421	121	994
S162	19601120	354	5	322	86	767	457	5	455	141	1051	188	224	484	562
	19601120	354	5	322	86	767	457	5	455	141	1051	188	224	484	562
S162	19801160	42	0	183	1	226	55	0	267	2	319	1090	1120	2656	2607
	19801160/1	22	0	148	1	171	33	0	213	2	248	0	0	0	0
	19801160/2	0	0	0	0	0	0	0	0	0	0	1090	1120	2656	2607
	19801160/3	20	0	135	0	155	22	0	154	0	171	0	0	0	0
S067	19801180	179	20	91	318	607	233	19	131	518	882	305	314	725	717
	19801180/1	78	11	52	115	256	102	10	77	207	396	105	105	250	240
	19801180/2	0	0	0	100	100	0	0	0	125	125	200	209	475	477
	19801180/3	101	9	39	103	251	131	9	54	186	361	0	0	0	0
S064	19801200	65	0	23	24	111	83	0	20	39	143	643	801	1611	1914
S188	20201040	19	0	9	0	28	24	0	15	0	39	572	600	1413	1440
	20201040/1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	20201040/2	4	0	0	0	4	4	0	0	0	4	285	285	704	684
	20201040/3	11	0	9	0	20	16	0	15	0	31	145	160	358	396
	20201040/4	4	0	0	0	4	4	0	0	0	4	142	150	351	360
S162	20201120	0	0	0	0	0	0	0	0	0	0	29	33	65	71
	20201120	0	0	0	0	0	0	0	0	0	0	29	33	65	71
S162	20401140	50	0	14	2	66	65	0	21	3	89	183	456	395	884
	20401140/1	50	0	14	2	66	65	0	21	3	89	0	0	0	0
	20401140/2	0	0	0	0	0	0	0	0	0	0	183	456	395	884
S067	20401160	261	19	1376	429	2085	338	18	2020	700	3016	787	1043	2024	2604
	20401160/1	261	19	1376	429	2085	338	18	2020	700	3016	0	0	0	0
	20401160/2	0	0	0	0	0	0	0	0	0	0	787	1043	2024	2604
	20401160/3	0	0	0	0	0	0	0	0	0	0	0	0	0	0

S067	20401220	0	16	14	15	45	0	15	12	25	54	17	18	38	39
	20401220	0	16	14	15	45	0	15	12	25	54	17	18	38	39
S069	20401240	82	6	265	504	857	105	6	395	816	1285	540	576	1269	1293
S067	20601120	0	0	0	20	20	0	0	0	22	22	498	563	1375	1519
	20601120/1	0	0	0	0	0	0	0	0	0	0	30	35	83	94
	20601120/2	0	0	0	20	20	0	0	0	22	22	0	0	0	0
	20601120/3	0	0	0	0	0	0	0	0	0	0	273	273	754	737
	20601120/4	0	0	0	0	0	0	0	0	0	0	195	255	538	688
S188	20601140	14	0	215	14	244	18	0	316	24	351	150	150	361	347
	20601140	0	0	0	0	0	0	0	0	0	0	121	121	291	280
S188	20801040	276	17	1108	51	1453	353	16	1567	84	2001	3668	3956	9364	9840
	20801040/1	50	4	311	15	380	68	4	759	29	834	0	0	0	0
	20801040/2	0	0	0	0	0	0	0	0	0	0	925	975	2362	2425
	20801040/3	0	0	0	0	0	0	0	0	0	0	496	496	1266	1234
	20801040/4	0	0	0	0	0	0	0	0	0	0	29	29	70	67
	20801040/5	0	0	0	0	0	0	0	0	0	0	632	632	1613	1572
	20801040/6	0	0	0	0	0	0	0	0	0	0	1180	1386	2931	3448
	20801040/7	0	0	0	0	0	0	0	0	0	0	150	150	383	373
	20801040/8	0	0	0	0	0	0	0	0	0	0	285	317	809	788
	20801040/9	125	6	479	27	637	134	6	518	45	703	0	0	0	0
	20801040/10	155	7	533	23	718	169	6	606	34	815	0	0	0	0
S067	20801120	73	0	392	90	555	95	0	579	147	804	659	675	1699	1688
	20801120/1	28	0	230	50	308	38	0	334	88	460	50	50	129	125
	20801120/2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	20801120/3	0	0	0	0	0	0	0	0	0	0	126	147	325	368
	20801120/4	30	0	218	40	288	42	0	310	59	396	0	0	0	0
S067	20801140	0	0	56	0	56	0	0	65	0	67	390	395	976	962
	20801140/1	15	0	0	0	15	15	0	0	0	15	873	873	2251	2183
S068	21001141	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S068	21001142	0	0	41	11	52	0	0	45	16	63	425	448	1217	1262
S067	21401100	25	16	25	2	68	33	15	33	3	86	124	131	406	409
	21401100/1	12	6	14	2	34	15	5	19	3	42	124	131	406	409
	21401100/2	13	10	11	0	34	18	10	14	0	44	0	0	0	0
S066	21601060	55	0	248	0	303	71	0	361	0	426	1144	1187	3079	3147
S065	21801080	0	0	25	19	45	0	0	34	31	64	181	194	434	451
S065	21801100	354	0	2612	110	3076	430	0	3784	155	4313	2970	3058	7911	8027
TOTAL		2131	103	7311	1744	11288	2692	97	10478	2802	15849	15961	18266	41010	45181

Notes: 1. Figures in red show the corrected employment and population by modified grid, which is same as that of table 2.
2. Figures in black show the employment and population by split TAZs.
3. Yellow shaded cells indicate that employment and population totals of the split TAZs do not match with that of for modified grids. This is because these split TAZs do not exactly follow the boundary of respective modified grids. Please see text for the explanation.

State Route 1 Land Use/Transportation Study

Technical Memorandum

B. Base Land Use Scenario Trip Generation

Prepared For:
Delaware Department of Transportation

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BASE LAND USE SCENARIO TRIP GENERATION

1. Introduction:

This technical memorandum explains trip generation for the Base Land Use Scenario. The generated trips have been assigned to the newly created split traffic analysis zones (TAZs) in the study area and they have been represented as trips entering and exiting each TAZ within the study area during Saturday peak hour.

2. Trip Generation for Build Out to Plan Scenario:

The base land use scenario considers existing establishments and land uses, which have been proposed or are developing or under construction. The trips associated with the existing establishments opened prior to 1998 have been taken into account in the traffic counts made in 1998. The trip generation estimation work for base land use scenario involves following two parts:

1. Generating trips for the establishments completed between 1998 and 2001 in the project study area, which have not been accounted for in the 1998 traffic counts.

2. Generating trips for the proposed/developing or under construction establishments in the project study area.

Table 1 shows trip generation related to establishments completed between 1998 and 2001 while **Table 2** shows trip generation for the proposed / developing or under construction establishments in the project study area. 6th Edition of the Institution of Transportation Engineers' (ITE) Trip Generation Manual has been used to estimate the number of trips generated by these establishments. The following methodology has been used to calculate trip generation.

<u>Residential Developments:</u>

For each of the proposed/developing residential land uses, the Sussex County tax parcel maps have been marked to show either total number of lots or type of zoning and area of the property. Based on this information and establishment type, the proper ITE code has been identified. Then total number of trips, entering trips and exiting trips have been calculated using either average rate or fitted curve equation for that ITE code for Saturday peak hour of the generator.

For example:

Tax parcels 3.01/4/5 on the Sussex County Tax Parcel Map # 3-34-19 have been marked to show a proposed development consisting of 125 single-family lots. Thus, ITE code 210 (single-family detached housing) has been used with the independent variable as dwelling units for Saturday peak hour of generator (Trip Generation Manual: 6th Edition, page 269)

Hence, total number of trips generated = (number of dwelling units) x (average rate)
= 125 x 0.94
= 118

Entering trips	=(total trips) x (directional distribution % for entering) = 118 x 0.54 = 64
Exiting trips	=(total trips) x (directional distribution % for exiting) = 118 x 0.46 = 54

If the tax parcel map is not marked to show exact number of dwelling units for the proposed/developing property, then the number of dwelling units has been calculated based on the land area of the parcel and the rate of dwelling units per acre for the property's zoning type. Once the number of dwelling units has been calculated, the above procedure has been used to calculate the total number of trips, entering trips and exiting trips.

For example:

Tax parcel 55 on the Sussex County Tax Parcel Map # 3-34-12 does not show the exact number of dwelling units. Zoning type for this parcel is AR1, the parcel area is 42.81 acres and dwelling units per acre rate for AR1 zoning is 2.

Thus, number of dwelling units = 42.81 x 2
= 86

Once the dwelling units are known, the procedure in the previous example has been repeated to calculate the total number of trips, entering trips and exiting trips.

<u>Commercial Developments:</u>

The ITE independent variable for calculating trip generation for commercial developments is Gross Floor Area (GFA). Since the exact GFA is not available, the following back calculation procedure has been used to calculate GFA and then trip generation was estimated.

Example:

Per acre weekday trip generation rates for commercial developments from 1985 report prepared by Kellerco of McLean, VA for FHWA were obtained from Bill Brockenbrough of DelDOT. This report does not provide Saturday rates. Hence back calculation to get GFA is required.

First, from the per acre rate for weekday PM peak hour and area of commercial development, the total number of trips generated during weekday PM peak were calculated.

For Parcel # 352 of the Sussex County Tax Parcel Map 3-34-6:

Trips generated during weekday PM peak	= (Area of parcel in acre) x (per acre rate) = 2.64 x 45.7 = 120.65

From these trips GFA was then back calculated using average rate for ITE code 815 (Free standing discount store)

Thus, GFA = (trips generated)/ (average rate) x 1000 (as independent variable is 1000 Sq. feet of GFA)
= (120.65 / 4.24) x 1000
= 28,455.188 sq. ft.
= 28.46 of 1000 sq. ft. (0.57 acre)

Then, using this GFA, the Saturday peak hour of generator trips, entering trips and exiting trips were calculated.

Thus, Saturday peak hour of generator trips = (1000 sq. ft of GFA) x (average rate)
= 28.46 x 7.66
= 218

Entering trips =(total trips) x (directional distribution % for entering)
= 218 x 0.51
= 111

Exiting trips =(total trips) x (directional distribution % for exiting)
= 218 x 0.49
= 107

Table 1

Trip Generation for the Establishments Developed between 1998 and 2001 (Base Land Use Scenario)

Map #	Map Parcel #	Name of the Establishment	Zoning	Area (acres)	Notes	Trip Generation	Entering Trips	Exiting Trips
3-34-6	63, 63.02	Savannah East & Harbor Towne Apts	C-1	13.58	152 Apts	79	40	39
3-34-6	499, 499.01	Savannah West & Mill Landing Apts	C-1/HR	8.91	72 Apts	37	19	18
3-34-6	83	Hub Associates Motel	C-1	2.17	80 Rooms	37	14	23
3-34-6	355.01,355.02	Bob Evans Restaurant	C-1	2.41	GFA 4,292 sq.ft.	46	27	19
		Credit Union (Bank)			GFA 4,075 sq.ft.	172	88	84
		Heritage Inn Motel			86 Rooms	39	15	24
3-34-6	355.04	Pelican Square Shopping Center	C-1	14.86	143,550 sq.ft. GFA	713	371	342
3-34-12	57.03	Hudson Home Sales	C-1	6.94		185	105	80
3-34-12	91, 92.01	McDonald's Restaurant with Drive-in	C-1	1.02	GFA 6,028 sq.ft.	355	181	174
		Hampton Inn Motel			85 Rooms	39	15	24
3-34-12	105.04	Wawa Convenience Store w/Gasoline	C-1	2.24	GFA 4,694 sq.ft.	456	228	228
3-34-12	124.02	Sea Chase Condominiums	HR2	10.64	69 Units	32	17	15
3-34-13	325.09	Happy Harry Drugstore	C-1	1.35		125	61	64
3-34-13	325.35, 325.39, 325.40, 325.41	Lighthouse Plaza Shopping Center Extension	C-1	12.62	76,535 sq.ft. GFA	380	198	182
3-34-13	307	Econo-Lodge Motel	C-1	4.52	44 Rooms	20	8	12
3-34-13	Portion of 350	Outback Restaurant	C-1	1.53	GFA 6,163 sq.ft.	67	40	27
3-34-13	325.25	Holiday Inn Express Motel	C-1	2.86	81 Rooms	37	14	23
					Total	**2819**	**1441**	**1378**

Table 2

Trip Generation for the Proposed/Developing or Under Construction Establishments (Base Land Use Scenario)

Map #	Map Parcel #	Status Code	Zoning	Area (acres)	Notes	Trip Generation	Entering Trips	Exiting Trips
3-35-12	1	Proposed	MR-RPC	106.77	586 units (mixed)**	551	298	253
3-34-5	167	Under Construction	AR-1	40.18	108 Lots**	102	55	47
3-34-5	222	Proposed	AR-1	119	476 MF	447	241	206
3-34-6	Dove Knoll	Under Construction	AR-1	90	113 lots subdivision**	106	57	49
3-34-6	526	Proposed	C-1	20	Home Depot	1651	842	809
3-34-6	352	Under Construction	C-1	2.64		218	111	107
3-34-12	55	Proposed	AR-1	42.81	86	81	44	37
3-34-12	56	Proposed	AR-1	30.63	214 MF Units**	124	67	57
3-34-12	57	Proposed	?	10	Medical Center** (20 Dr.)	89	45	44
3-34-12	96	Under Construction	C-1	1.76		145	74	71
3-34-12	107	Proposed	AR-1	30	Cape Henlopen School**	480	355	125
3-34-12	127	Under Construction	C-1	20.06	Wal-Mart**	1656	845	812
3-34-12	127.03	Proposed	C-1	3.1	Offices**	256	131	125
3-34-12	Adjoining 180	Proposed	MR-RPC	?	SF 50 Units**	47	25	22
3-34-13	3.01	Under Construction	C-1	11.91	120 MF Units**	113	58	55
3-34-13	3.01	Under Construction	GR	8	32 MF Units**	30	16	14
3-34-13	362	Proposed	MR-RPC	29.31	60 DU**	56	30	26
3-34-18	?	Under Construction	MR-RPC		145 S.F. Units**	136	73	63
3-34-19	3.01, 4, 5	Proposed	MR-RPC	51.25	125 SF Units**	118	64	54
3-34-19	150	Proposed	MR	18	48 SF Units**	45	24	21
3-34-19	154	Proposed	MR	11.23	31 lots**	29	16	13
					TOTAL	6481	3471	3010

Table 3 shows the total entering and exiting trips associated with the Base Land Use Scenario by study area TAZs.

Table 3 - Total Entering and Exiting Trips by TAZs For the Base Land Use Scenario

New SplitTAZ	Entering Trips	Exiting Trips
18601120/1	0	0
18601120/2	0	0
18801180/1	0	0
18801180/2	55	47
19001120	0	0
19401080/1	0	0
19401080/2	0	0
19401140/1	241	206
19401140/2	0	0
19401180/1	0	0
19401180/2	298	253
19601120	0	0
19801160/1	842	809
19801160/2	9	9
19801160/3	10	9
19801180/1	40	39
19801180/2	0	0
19801180/3	14	23
19801200	0	0
20201040/1	0	0
20201040/2	0	0
20201040/3	355	125
20201040/4	0	0
20201120	105	80
20401140/1	882	845
20401140/2	111	94
20401160/1	0	0
20401160/2	57	49
20401160/3	0	0
20401220	0	0
20401240	0	0
20601120/1	0	0
20601120/2	0	0
20601120/3	0	0
20601120/4	30	26
20601140	62	59
20801040/1	976	937
20801040/2	0	0
20801040/3	25	22
20801040/4	73	63

20801040/5	0	0
20801040/6	104	88
20801040/7	0	0
20801040/8	0	0
20801040/9	0	0
20801040/10	22	35
20801120/1	286	283
20801120/2	0	0
20801120/3	0	0
20801120/4	259	246
20801140/1	16	14
21001141	0	0
21001142	0	0
21401100/1	0	0
21401100/2	40	27
21601060	0	0
21801080	0	0
21801100	0	0
Total	**4912**	**4388**

State Route 1 Land Use/Transportation Study

Technical Memorandum

C. Trip Generation for the Build-Out-To-Plan Land Use Scenario

Prepared For:
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1. Introduction:

This technical memorandum explains the trip generation for "build out to plan" scenario. The generated trips have been assigned to the newly created split traffic analysis zones (TAZs) in the study area and they have been represented as trips entering and exiting each TAZ within the study area during Saturday peak hour.

2. Trip Generation for Build Out to Plan Scenario:

"Build out to plan" scenario represents all the parcels in the study area developed according to the existing zoning. Thus, total generated trips for this scenario will be addition of following two cases:

a) The newly generated trips already calculated for the base land use scenario (Trips generated by currently proposed or developing establishments in the study area.)
b) Trips generated by the vacant parcels in the study area assuming they will be developed according to current zoning and trips generated by some farmlands parcels assuming that these existing farmland parcels within agricultural residential zoning will be converted into residential subdivisions.

3. Assumptions Used for Calculating Trip Generation for Vacant/Farmland Parcels:

a) Vacant parcels/farmlands with AR-1 zoning within the development district will be developed at 4DU/acre rate. For calculating the trip generation for these parcels, single family detached housing land use code (210), from 6th Edition of ITE's Trip Generation Manual, has been used.
b) Vacant parcels/farmlands with AR-1 zoning outside of the development district will be developed at 2DU/acre rate. For calculating the trip generation for these parcels, single family detached housing land use code (210), from 6th Edition of ITE's Trip Generation Manual, has been used.
c) Vacant parcels with B-1 / MR / GR zonings will be developed at 4DU/acre rate throughout the study area (i.e. both within and outside of development district). This is because these zoning categories allow 4DU/acre density with central sewer. Single family detached housing land use code (210), from 6th Edition of ITE's Trip Generation Manual, has been used for calculating the trip generation for these parcels.
d) Vacant parcels/farmlands with HR zoning will be developed at 12DU/acre rate both within and outside of development district (Note: The study area doesn't have any HR zoned parcels outside of development district). Apartment land use code (220),

from 6th Edition of ITE's Trip Generation Manual, has been used for calculating the trip generation for these parcels.

e) Vacant parcels/farmlands within C-1 zoning will be developed as commercial properties. Freestanding Discount Store land use code (815), from 6th Edition of ITE's Trip Generation Manual, has been used for calculating the trip generation for these parcels.

Table 1 shows the trip generation for the vacant parcels and farmlands based on above assumptions. Most of the parcels in Table 1 lie entirely within a single zoning category. Only one parcel (parcel # 39, tax map # 3-34-6) has some of its portion in C-1 zoning and remaining portion in AR-1 zoning. The portions are numbered as 39/1 and 39/2, and the trip generation for these two portions have been calculated separately based on their respective areas.

Few parcels have some portion in development district and remaining portion outside of development district. The trip generation for these portions has been calculated separately based on the respective rates.

For example:

Parcel # 175 (Tax map # 3-34-5):
Area outside development district (numbered as 175/1) = 401.72 acres (2du/acre)
Area inside development district (numbered as 175/2) = 17.92 acres (4du/acre)

Parcel # 177 (Tax map # 3-34-5):
Area outside development district (numbered as 177/1) = 63.53 acres (2du/acre)
Area inside development district (numbered as 177/2) = 17.50 acres (4du/acre)

Parcel # 42 (Tax map # 3-34-18):
Area outside development district (numbered as 42/1) = 22.4 acres (2du/acre)
Area inside development district (numbered as 42/2) = 223.92 acres (4du/acre)

4. Total Trip Generation by TAZs:

Table 2 shows newly generated trips by TAZs for the "base land use scenario" and **Table 3** shows newly generated trips associated with vacant and farmland parcels. Together, the trip generation for "build out to plan" land use scenario is shown in **Table 4** (addition of Table 2 and Table 3).

Table 1: Trip Generation for Vacant Parcels and Farmlands
Build Out to Plan Land Use Scenario

Map #	Map Parcel #	Status Code	Zoning	Within Dev.District	TAZ #	Area (acres)	Units	Trip Gen.	Entering Trips	Exiting Trips
				Codes: 4=Yes, 2=No						
3-34-1	9	Vacant	AR-1	2	18801200	391.17	782	735	397	338
3-34-1	15.02	Vacant	AR-1	2	18801200	3.74	7	7	4	3
3-34-1	15.03	Vacant	AR-1	2	18801200	3.74	7	7	4	3
3-34-1	16	Vacant	AR-1	2	18801200	1.23	2	2	1	1
3-34-1	16.01	Vacant	AR-1	2	18801200	0.24	1	1	1	0
3-34-1	16.05	Vacant	AR-1	2	18801200	1.27	3	2	1	1
3-34-1	16.07	Vacant	AR-1	2	18801200	1.23	2	2	1	1
3-34-1	16.08	Vacant	AR-1	2	18801200	1.23	2	2	1	1
3-34-1	16.09	Vacant	AR-1	2	18801200	1.23	2	2	1	1
3-34-1	16.1	Vacant	AR-1	2	18801200	1.23	2	2	1	1
3-34-1	27.01	Vacant	AR-1	2	18801200	4.94	10	9	5	4
3-34-1	4	Vacant	C-1		18801200	2.43		201	102	98
3-34-1	6.07	Vacant	C-1		18801200	1.07		88	45	43
3-34-1	6.01	Vacant	C-1		18801200	1.00		83	42	40
3-34-1	6.06	Vacant	C-1		18801200	1.35		111	57	55
3-34-1	6	Vacant	C-1		18801200	1.34		111	56	54
3-34-11	3.01	Farmland	AR-1	2	19001120	46.41	93	87	47	40
3-34-11	5	Farmland	AR-1	2	19001120	248.75	498	468	253	215
3-34-11	7	Farmland	AR-1	2	19001120	21.13	42	40	21	18
3-34-11	7.03	Farmland	AR-1	2	19001120	21	42	39	21	18
3-34-11	7.04	Farmland	AR-1	2	19001120	32.07	64	60	33	28
3-34-11	7.05	Farmland	AR-1	2	19001120	10.94	22	21	11	9
3-34-11	8	Farmland	AR-1	2	19001120	44.1	88	83	45	38
3-34-11	12	Vacant	GR	2	19001120	0.53	1	1	1	0
3-34-11	13	Vacant	GR	2	19001120	0.81	2	2	1	1
3-34-11	20	Farmland	GR	4	19001120	6.13	25	23	12	11
3-34-11	21	Farmland	AR-1	2	19001120	17.15	34	32	17	15
3-34-11	22	Farmland	AR-1	2	19001120	17.2	34	32	17	15
3-34-11	Adjoining 22	Farmland	AR-1	2	19001120	28.2	56	53	29	24
3-34-11	25	Farmland	GR	4	19001120	10.72	43	40	22	19
3-34-11	46	Farmland	AR-1	2	19601120	52.6	105	99	53	45

3-34-11	Adjoining 47	Vacant	AR-1	2	19601120	0.6	1	1	1	0
3-34-11	Adjoining 47	Vacant	AR-1	2	19601120	0.6	1	1	1	0
3-34-11	Adjoining 47	Vacant	AR-1	2	19601120	0.6	1	1	1	0
3-34-11	Adjoining 47	Vacant	AR-1	2	19601120	0.4	1	1	1	0
3-34-11	49	Vacant	AR-1	2	19601120	2.53	5	5	3	2
3-34-11	81	Farmland	AR-1	2	19601120	48.33	97	91	49	42
3-34-11	81.01	Vacant	AR-1	2	19601120	0.75	1	1	1	0
3-34-11	81.02	Vacant	AR-1	2	19601120	0.75	1	1	1	0
3-34-11	81.03	Vacant	AR-1	2	19601120	0.75	1	1	1	0
3-34-11	81.04	Vacant	AR-1	2	19601120	0.75	1	1	1	0
3-34-11	83	Farmland	AR-1	2	19401080/2	97.4	195	183	99	84
3-34-11	86	Farmland	AR-1	2	19401080/2	39.2	78	74	40	34
3-34-11	98.01	Vacant	GR	4	19401080/2	0.14	1	1	1	0
3-34-11	98.02	Vacant	GR	4	19401080/2	0.14	1	1	1	0
3-34-11	28	Vacant	GR	2	19401140/2	0.14	1	1	1	0
3-34-11	29	Farmland	AR-1	2	19401140/2	32.44	65	61	33	28
3-34-11	30	Vacant	GR	2	19401140/2	3	6	6	3	3
3-34-11	31	Vacant	GR	2	19401140/2	0.12	1	1	1	0
3-34-11	41	Vacant	GR	2	19401140/2	0.69	1	1	2	-1
3-34-11	42	Vacant	AR-1	2	19401140/2	9.4	19	18	10	8
3-34-11	43	Farmland	AR-1	2	19401140/2	53.45	107	100	54	46
3-34-11	43.01	Farmland	AR-1	2	19401140/2	35	70	66	36	30
3-34-11	45	Farmland	AR-1	2	19401140/2	61.7	123	116	63	53
3-34-12	2	Farmland	AR-1	4	19601120	12.46	50	47	25	22
3-34-12	3.01	Farmland	AR-1	4	19601120	8.89	36	33	18	15
3-34-12	5	Farmland	AR-1	2	19601120	27.18	54	51	28	24
3-34-12	6	Farmland	AR-1	2	19601120	48.8	98	92	50	42
3-34-12	6.01	Farmland	AR-1	2	19601120	37.88	76	71	38	33
3-34-12	8	Vacant	AR-1	2	19601120	4	8	8	4	3
3-34-12	9	Vacant	AR-1	2	19601120	1	2	2	1	1
3-34-12	10.01	Vacant	AR-1	2	19601120	2.4	5	5	3	2
3-34-12	11	Vacant	AR-1	2	19601120	1.04	2	2	1	1
3-34-12	13	Farmland	AR-1	2	19601120	133.66	267	251	136	116
3-34-12	13.01	Farmland	AR-1	2	19601120	66.84	134	126	68	58
3-34-12	46	Farmland	AR-1	2	20201120	37.11	74	70	38	32
3-34-12	47	Farmland	AR-1	2	20201120	40.7	81	77	41	35
3-34-12	48.02	Vacant	AR-1	2	20201120	0.53	1	1	1	0

3-34-12	48.03	Vacant	AR-1		2	20201120	0.03	1	1	1	0
3-34-12	50	Vacant	AR-1		2	20201120	1	2	2	1	1
3-34-12	51	Vacant	AR-1		2	20201120	4.7	9	9	5	4
3-34-12	52	Farmland	AR-1		2	20201120	124.5	249	234	126	108
3-34-12	57.01	Farmland	AR-1		2	20201120	8.76	18	16	9	8
3-34-12	57.04	Farmland	AR-1		4	20201120	32.79	131	123	67	57
3-34-12	57	Farmland	AR-1		4	20601140	33.85	135	127	69	59
3-34-12	123.01	Vacant	AR-1		4	20601140	8.94	18	17	9	8
3-34-12	123.02/1	Vacant	B-1			20601140	1	4	2	1	1
3-34-12	123.02/2	Farmland	AR-1		4	20601140	22.55	90	85	46	39
3-34-12	125	Farmland	AR-1		4	20601140	16.25	65	61	33	28
3-34-12	127.01	Farmland	AR-1		4	20601140	55.66	223	209	113	96
3-34-12	15.07	Vacant	GR		4	19401080/2	0.43	2	2	1	1
3-34-12	16/1	Farmland	GR		4	19401080/2	84.35	337	317	171	146
3-34-12	16/2	Farmland	AR-1		2	19401080/2	239.84	480	451	243	207
3-34-12	17	Farmland	AR-1		2	19401080/2	67.4	135	127	68	58
3-34-12	17.01	Vacant	AR-1		2	19401080/2	0.5	1	1	1	0
3-34-12	19	Farmland	AR-1		2	19401080/2	51	102	96	52	44
3-34-12	22	Farmland	AR-1		2	19401080/2	6	12	11	6	5
3-34-12	44	Vacant	AR-1		2	19401080/2	0.28	1	1	1	0
3-34-12	45.01	Vacant	AR-1		2	19401080/2	0.63	1	1	1	0
3-34-12	46.01	Farmland	AR-1		2	20201040/1	46.24	92	87	47	40
3-34-12	113	Farmland	AR-1		2	20201040/1	197	394	370	200	170
3-34-12	116	Farmland	AR-1		2	20201040/1	43	86	81	44	37
3-34-12	122.03	Farmland	AR-1		2	20201040/2	34.65	69	65	35	30
3-34-13	334	Farmland	MR		4	20601120/4	51.67	207	194	105	89
3-34-13	334.01	Farmland	MR		4	20601120/4	60.23	241	226	122	104
3-34-13	334.02	Farmland	MR		4	20601120/4	27.25	109	102	55	47
3-34-13	334.03	Farmland	MR		4	20601120/4	15	60	56	30	26
3-34-13	334.04	Farmland	MR		4	20601120/4	15	60	56	30	26
3-34-13	335	Farmland	AR-1		4	20601120/4	8.47	34	32	17	15
3-34-13	325.18	Vacant	C-1			20801040/10	11.66		963	491	472
3-34-13	164.01	Vacant	AR-1		4	20801040/2	0.68	3	3	2	1
3-34-13	171.01	Vacant	AR-1		4	20801040/2	1.51	6	6	3	3
3-34-13	171.02	Vacant	AR-1		4	20801040/2	1.25	5	5	3	2
3-34-13	185.01	Vacant	AR-1		4	20801040/2	0.5	2	2	1	1
3-34-13	325.07	Vacant	MR		4	20801040/6	1.98	8	8	4	4

3-34-13	319	Vacant	C-1		20801040/9	0.46		38	19	19
3-34-13	325.01	Vacant	C-1		20801040/9	4.83		399	203	195
3-34-13	325.24	Vacant	C-1		20801040/9	4.25		351	179	172
3-34-13	3	Vacant	C-1		20801120/1	0.5		41	21	20
3-34-13	8.04	Vacant	C-1		20801120/1	0.62		51	26	25
3-34-13	325	Farmland	AR-1	4	20801120/3	41.4	166	156	84	72
3-34-13	341	Vacant	AR-1	4	20801120/3	1	4	4	2	2
3-34-13	342	Vacant	AR-1	4	20801120/3	5.45	22	20	11	9
3-34-13	343	Vacant	AR-1	4	20801120/3	6.16	25	23	13	11
3-34-13	325.41	Vacant	C-1		20801120/4	0.6		50	25	24
3-34-13	106.01	Vacant	GR	4	20801140/1	0.41	2	2	1	1
3-34-13	325.08	Vacant	C-1		21401100/2	2.37		196	100	96
3-34-13	325.14	Vacant	C-1		21401100/2	2.35		194	99	95
3-34-13	325.15	Vacant	C-1		21401100/2	2.4		198	101	97
3-34-13	325.28	Vacant	AR-1	4	21401100/2	3.19	13	12	6	6
3-34-13	356	Vacant	C-1		21401100/2	0.6		50	25	24
3-34-13	360	Vacant	C-1		21401100/2	3.7		305	156	150
3-34-18	2	Farmland	AR-1	2	19401080/1	72.42	145	136	74	63
3-34-18	8	Vacant	MR	4	19401080/1	0.45	2	2	1	1
3-34-18	13	Farmland	AR-1	2	19401080/1	22.03	44	41	22	19
3-34-18	14	Vacant	MR	4	19401080/1	0.3	1	1	1	0
3-34-18	15	Vacant	MR	4	19401080/1	0.37	1	1	1	0
3-34-18	16	Vacant	MR	4	19401080/1	0.32	1	1	1	0
3-34-18	17	Vacant	MR	4	19401080/1	0.3	1	1	1	0
3-34-18	42/1	Farmland	AR-1	2	20201040/1	22.4	45	42	23	19
3-34-18	42/2	Farmland	AR-1	4	20201040/1	223.92	896	842	455	387
3-34-18	42.02	Vacant	AR-1	4	20201040/1	1.68	7	6	3	3
3-34-18	43	Farmland	AR-1	4	20201040/1	170	680	639	345	294
3-34-18	31	Vacant	AR-1	4	20201040/3	3.84	15	14	8	7
3-34-18	38.05	Vacant	AR-1	4	20201040/3	2.16	9	8	4	4
3-34-18	40.01	Farmland	AR-1	2	20201040/3	36.3	73	68	37	31
3-34-18	564	Vacant	AR-1	4	20201040/3	1.05	4	4	2	2
3-34-18	565	Vacant	AR-1	4	20201040/3	1.08	4	4	2	2
3-34-18	566	Vacant	AR-1	4	20201040/3	2.41	10	9	5	4
3-34-18	567	Vacant	AR-1	4	20201040/3	1.31	5	5	3	2
3-34-18	568	Vacant	AR-1	4	20201040/3	1.48	6	6	3	3
3-34-18	569	Vacant	AR-1	4	20201040/3	1.48	6	6	3	3

3-34-18	570	Vacant	AR-1	4	20201040/3	1.78	7	7	4	3
3-34-18	571	Vacant	AR-1	4	20201040/3	2.16	9	8	4	4
3-34-18	572	Vacant	AR-1	4	20201040/3	2.19	9	8	4	4
3-34-18	573	Vacant	AR-1	4	20201040/3	1.79	7	7	4	3
3-34-18	574	Vacant	AR-1	4	20201040/3	1.54	6	6	3	3
3-34-18	575	Vacant	AR-1	4	20201040/3	1.91	8	7	4	3
3-34-18	576	Vacant	AR-1	4	20201040/3	1.46	6	5	3	3
3-34-18	577	Vacant	AR-1	4	20201040/3	1.7	7	6	3	3
3-34-18	578	Vacant	AR-1	4	20201040/3	1.73	7	7	4	3
3-34-18	579	Vacant	AR-1	4	20201040/3	1.53	6	6	3	3
3-34-18	581	Vacant	AR-1	4	20201040/3	1.07	4	4	2	2
3-34-18	582	Vacant	AR-1	4	20201040/3	1.06	4	4	2	2
3-34-18	41	Vacant	AR-1	2	20201040/4	2.26	5	4	2	2
3-34-18	47	Vacant	AR-1	4	20201040/4	1	4	4	2	2
3-34-18	48	Vacant	AR-1	4	20201040/4	0.17	1	1	1	0
3-34-18	78	Vacant	AR-1	4	20201040/4	3.8	15	14	8	7
3-34-18	200	Vacant	AR-1	4	20201040/4	3.18	13	12	6	6
3-34-18	416	Farmland	AR-1	4	20801040/4	36.6	146	138	74	63
3-34-18	417	Farmland	AR-1	4	20801040/4	32.8	131	123	67	57
3-34-18	418	Farmland	AR-1	4	20801040/4	45.9	184	173	93	79
3-34-19	10	Vacant	AR-1	4	20801040/3	0.19	1	1	1	0
3-34-19	13.03	Vacant	AR-1	4	20801040/3	0.22	1	1	1	0
3-34-19	13.04	Vacant	AR-1	4	20801040/3	0.22	1	1	1	0
3-34-19	18	Vacant	AR-1	4	20801040/3	0.1	1	1	1	0
3-34-19	20.01	Vacant	AR-1	4	20801040/3	0.2	1	1	1	0
3-34-19	21.01	Vacant	AR-1	4	20801040/3	0.1	1	1	1	0
3-34-19	21.04	Vacant	AR-1	4	20801040/3	0.32	1	1	1	1
3-34-19	21.07	Vacant	AR-1	4	20801040/3	0.08	1	1	1	0
3-34-19	21.08	Vacant	AR-1	4	20801040/3	1.67	7	6	3	3
3-34-19	21.1	Vacant	AR-1	4	20801040/3	0.44	2	2	1	1
3-34-19	21.6	Vacant	AR-1	4	20801040/3	0.39	2	1	1	0
3-34-19	1.03	Farmland	AR-1	4	20801040/4	82.6	330	311	168	143
3-34-19	1.05	Farmland	AR-1	4	20801040/4	59.2	237	223	120	102
3-34-19	154.01	Pending	MR	4	20801040/6	19	76	71	39	33
3-34-19	380.01	Vacant	MR	4	20801040/6	25.58	102	96	52	44
3-34-19	380.02	Vacant	MR	4	20801040/6	2.4	10	9	5	4
3-34-19	380.03	Vacant	MR	4	20801040/6	2.28	9	9	5	4

3-34-19	380.04	Vacant	MR	4	20801040/6	2.28	9	9	5	4
3-34-5	168	Vacant	AR-1	2	18201180	11.96	24	22	12	10
3-34-5	72.03	Vacant	AR-1	2	18801200	8.03	16	15	8	7
3-34-5	72.02	Farmland	AR-1	2	18801200	15.32	31	29	16	13
3-34-5	174	Farmland	AR-1	2	18601120/2	102.23	204	192	104	88
3-34-5	175/1	Farmland	AR-1	2	18601120/2	401.72	803	755	408	347
3-34-5	176	Vacant	AR-1		18601120/2	3.32	7	7	4	3
3-34-5	177/1	Farmland	AR-1	2	18601120/2	63.53	127	119	64	55
3-34-5	180	Vacant	AR-1	2	18601120/2	0.43	1	1	1	0
3-34-5	141	Vacant	C-1		18801180/1	2.44		201	103	99
3-34-5	143	Vacant	C-1		18801180/1	1.9		157	80	77
3-34-5	144.01	Vacant	C-1		18801180/1	0.43		36	18	17
3-34-5	147	Vacant	C-1		18801180/1	0.83		69	35	34
3-34-5	152.02	Vacant	C-1		18801180/1	1.32		109	56	53
3-34-5	152.03	Vacant	C-1		18801180/1	0.46		38	19	19
3-34-5	70	Farmland	AR-1	4	18801180/2	109.66	439	412	223	190
3-34-5	153	Farmland	AR-1	4	18801180/2	61.39	246	231	125	106
3-34-5	225.02	Vacant	AR-1	4	19401140/1	5.05	20	19	10	9
3-34-5	175/2	Farmland	AR-1	4	19401140/2	17.92	72	67	36	31
3-34-5	177/2	Farmland	AR-1	4	19401140/2	17.5	70	66	36	30
3-34-5	222.01	Vacant	AR-1	4	19401140/2	19.53	78	73	40	34
3-34-5	78	Vacant	C-1		19401180/2	0.42		35	18	17
3-34-5	80.02	Vacant	C-1		19401180/2	0.29		24	12	12
3-34-5	88	Vacant	C-1		19401180/2	0.76		63	32	31
3-34-5	90	Vacant	C-1		19401180/2	2.33		192	98	94
3-34-6	550	Vacant	AR-1	4	19601120	0.76	3	3	2	1
3-34-6	551.01	Vacant/Farm	AR-1	4	19601120	15	60	56	30	26
3-34-6	552	Farmland	AR-1	2	19601120	11.2	22	21	11	10
3-34-6	1257	Vacant	AR-1	2	19601120	0.48	1	1	1	0
3-34-6	1299	Vacant	AR-1	4	19401140/1	0.66	3	2	1	1
3-34-6	687	Vacant	C-1		19801160/1	6.49		536	273	263
3-34-6	500	Vacant	AR-1	4	19801160/2	2.9	12	11	6	5
3-34-6	502	Vacant	AR-1	4	19801160/2	0.7	3	3	2	1
3-34-6	503	Farmland	AR-1	4	19801160/2	26.36	105	99	54	46
3-34-6	504.02	Vacant	AR-1	4	19801160/2	10.5	42	39	21	18
3-34-6	504.05	Vacant	AR-1	4	19801160/2	1.88	8	7	4	3
3-34-6	504.06	Vacant	AR-1	4	19801160/2	1	4	4	2	2

3-34-6	511	Vacant	AR-1	4	19801160/2	4.92	20	18	10	9
3-34-6	511.04	Vacant	AR-1	4	19801160/2	0.16	1	1	1	0
3-34-6	523	Vacant/Farm	AR-1	4	19801160/2	14.62	58	55	30	25
3-34-6	526/2	Vacant	AR-1	4	19801160/2	20.81	83	78	42	36
3-34-6	683	Vacant	AR-1	4	19801160/2	0.44	2	2	1	1
3-34-6	686	Vacant	AR-1	4	19801160/2	0.44	2	2	1	1
3-34-6	490	Vacant	C-1		19801160/3	0.66		54	28	27
3-34-6	497	Vacant	C-1		19801160/3	20.71		1710	872	838
3-34-6	4.03	Vacant	C-1		19801180/1	0.6		50	25	24
3-34-6	4.04	Vacant	C-1		19801180/1	0.4		33	17	16
3-34-6	23	Vacant	C-1		19801180/1	5.19		429	219	210
3-34-6	36	Vacant	C-1		19801180/1	0.2		17	8	8
3-34-6	37	Vacant	C-1		19801180/1	0.4		33	17	16
3-34-6	39/1	Farmland	C-1		19801180/1	14.09		1163	593	570
3-34-6	39/2	Farmland	AR-1	4	19801180/2	28.18	113	106	57	49
3-34-6	55	Vacant	AR-1	4	19801180/2	9.73	39	37	20	17
3-34-6	56	Vacant	AR-1	4	19801180/2	5.2	21	20	11	9
3-34-6	57	Vacant	AR-1	4	19801180/2	6.6	26	25	13	11
3-34-6	58	Vacant	AR-1	4	19801180/2	0.8	3	3	2	1
3-34-6	59	Vacant	AR-1	4	19801180/2	0.2	1	1	1	0
3-34-6	60	Vacant	AR-1	4	19801180/2	0.2	1	1	1	0
3-34-6	61	Vacant	AR-1	4	19801180/2	0.4	2	2	1	1
3-34-6	62	Vacant	AR-1	4	19801180/2	3.52	14	13	7	6
3-34-6	63.03	Vacant	C-1		19801180/2	1.58		130	67	64
3-34-6	63.04	Vacant	AR-1	4	19801180/2	0.8	3	3	2	1
3-34-6	70	Vacant	MR-RPC		20401160/2	6.5	26	24	13	11
3-34-6	66.02	Vacant/Farm	AR-1	4	20401160/3	26.29	105	99	54	45
3-34-6	68	Vacant	AR-1	4	20401160/3	2.58	10	10	5	5
3-34-7	3	Vacant	GR	4	20401160/2	0.18	1	1	1	0
3-34-7	12.04	Vacant	GR	4	20401160/2	0.5	2	2	1	1
3-34-7	16.02	Vacant	AR-1	4	20801140/1	0.41	2	2	1	1
3-35-11	55	Vacant	AR-1	4	19401180/2	7.55	30	28	15	13
3-35-11	56	Vacant	AR-1	4	19401180/2	13.42	54	50	27	23
3-35-11	59	Vacant	AR-1	4	19401180/2	19.55	78	74	40	34
3-35-12	3	Farmland	AR-1	4	20401160/3	490.36	1961	1844	996	848
3-35-7	6	Farmland	AR-1	2	18801200	82.88	166	156	84	72
3-35-7	7.02	Vacant	AR-1	2	18801200	3.09	6	6	3	3

3-35-7	7.04	Vacant	AR-1	2	18801200	2.48	5	5	3	2
3-35-7	34	Vacant	AR-1	2	18801200	1.00	2	2	1	1
3-35-7	35	Vacant	AR-1	2	18801200	1.00	2	2	1	1
3-35-7	36	Vacant	AR-1	2	18801200	1.00	2	2	1	1
3-35-7	37	Vacant	AR-1	2	18801200	1.00	2	2	1	1
3-35-7	38	Vacant	AR-1	2	18801200	1.00	2	2	1	1
3-35-7	part 1	Farmland	AR-1	2	18801200	160.00	320	301	162	138
3-35-8	2	Vacant	AR-1	2	18801200	138.06	276	260	140	119
3-35-8	27.06	Vacant	AR-1	4	19801200	1.64	7	6	3	3
3-35-8	27.03	Vacant	AR-1	4	19801200	1.76	7	7	4	3
3-35-8	27.05	Vacant	AR-1	4	19801200	1.80	7	7	4	3
3-35-8	27.04	Vacant	AR-1	4	19801200	7.66	31	29	16	13
3-35-8	27.07	Vacant	AR-1	4	19801200	10.00	40	38	20	17
3-35-8	27.09	Vacant	AR-1	4	19801200	11.30	45	42	23	20
3-35-8	27.08	Vacant	AR-1	4	19801200	9.10	36	34	18	16
3-35-8	part 26	Farmland	AR-1	4	19801200	40.00	160	150	81	69
3-35-8	43	Farmland	AR-1	4	20401220	95.86	383	360	195	166
3-35-8	51	Farmland	AR-1	4	20401240	43,71	175	164	89	76
3-35-8	part 53	Farmland	AR-1	4	20401240	45.00	180	169	91	78
3-35-8	50.02	Vacant	AR-1	4	20401240	4.68	19	18	10	8
3-35-8	46	Farmland	AR-1	4	20401240	24.00	96	90	49	42
3-35-8	47	Farmland	AR-1	4	20401240	8.00	32	30	16	14
3-35-8	48	Farmland	AR-1	4	20401240	16.00	64	60	32	28
3-35-8	36	Farmland	AR-1	4	20401240	12.71	51	48	26	22
3-35-9	1.01	Vacant	AR-1	4	20401240	22.50	90	85	46	39
3-35-9	9	Vacant	AR-1	4	20401240	8.51	34	32	17	15
							17881			
							TOTAL	25313	13425	11888

Table 2 - Entering and Exiting Trips by TAZs for the Base Land Use Scenario

New SplitTAZ	Entering Trips	Exiting Trips
18201180	0	0
18601120/1	0	0
18601120/2	0	0
18801180/1	0	0
18801180/2	55	47
18801200	0	0
19001120	0	0
19401080/1	0	0
19401080/2	0	0
19401140/1	241	206
19401140/2	0	0
19401180/1	0	0
19401180/2	298	253
19601120	0	0
19801160/1	842	809
19801160/2	9	9
19801160/3	10	9
19801180/1	40	39
19801180/2	0	0
19801180/3	14	23
19801200	0	0
20201040/1	0	0
20201040/2	0	0
20201040/3	355	125
20201040/4	0	0
20201120	105	80
20401140/1	882	845
20401140/2	111	94
20401160/1	0	0
20401160/2	57	49
20401160/3	0	0
20401220	0	0
20401240	0	0
20601120/1	0	0
20601120/2	0	0
20601120/3	0	0
20601120/4	30	26
20601140	62	59
20801040/1	996	937
20801040/2	0	0
20801040/3	25	22
20801040/4	73	63
20801040/5	0	0
20801040/6	104	88
20801040/7	0	0
20801040/8	0	0
20801040/9	0	0
20801040/10	22	35

20801120/1	286	283
20801120/2	0	0
20801120/3	0	0
20801120/4	259	246
20801140/1	16	14
21001141	0	0
21001142	0	0
21401100/1	0	0
21401100/2	40	27
21601060	0	0
21801080	0	0
21801100	0	0
Total	**4932**	**4388**

Table 3 - Entering and Exiting Trips by TAZs for Vacant Parcels and Farmlands

New SplitTAZ	Entering Trips	Exiting Trips
18201180	12	10
18601120/1	0	0
18601120/2	581	494
18801180/1	311	299
18801180/2	347	296
18801200	1142	1006
19001120	530	451
19401080/1	101	83
19401080/2	683	582
19401140/1	12	10
19401140/2	313	263
19401180/1	0	0
19401180/2	242	224
19601120	524	446
19801160/1	273	263
19801160/2	173	145
19801160/3	900	865
19801180/1	879	845
19801180/2	181	159
19801180/3	0	0
19801200	169	144
20201040/1	1117	951
20201040/2	35	30
20201040/3	107	91
20201040/4	19	15
20201120	288	245
20401140/1	0	0
20401140/2	0	0
20401160/1	0	0
20401160/2	15	12
20401160/3	1055	898
20401220	195	166
20401240	376	320
20601120/1	0	0
20601120/2	0	0
20601120/3	0	0
20601120/4	361	307
20601140	271	231
20801040/1	0	0
20801040/2	9	6
20801040/3	11	5
20801040/4	522	445
20801040/5	0	0
20801040/6	108	93
20801040/7	0	0
20801040/8	0	0
20801040/9	402	386
20801040/10	491	472

20801120/1	47	45
20801120/2	0	0
20801120/3	110	93
20801120/4	25	24
20801140/1	2	2
21001141	0	0
21001142	0	0
21401100/1	0	0
21401100/2	487	468
21601060	0	0
21801080	0	0
21801100	0	0
Total	**13426**	**11890**

Table 4 - Total Entering and Exiting Trips by TAZs for the "Build Out to Plan" Land Use Scenario

New SplitTAZ	Entering Trips	Exiting Trips
18201180	12	10
18601120/1	0	0
18601120/2	581	494
18801180/1	311	299
18801180/2	402	343
18801200	1142	1006
19001120	530	451
19401080/1	101	83
19401080/2	683	582
19401140/1	253	216
19401140/2	313	263
19401180/1	0	0
19401180/2	540	477
19601120	524	446
19801160/1	1115	1072
19801160/2	182	154
19801160/3	910	874
19801180/1	919	884
19801180/2	181	159
19801180/3	14	23
19801200	169	144
20201040/1	1117	951
20201040/2	35	30
20201040/3	462	216
20201040/4	19	15
20201120	393	325
20401140/1	882	845
20401140/2	111	94
20401160/1	0	0
20401160/2	72	61
20401160/3	1055	898
20401220	195	166
20401240	376	320
20601120/1	0	0
20601120/2	0	0
20601120/3	0	0
20601120/4	391	333
20601140	333	290
20801040/1	996	937
20801040/2	9	6
20801040/3	36	27
20801040/4	595	508
20801040/5	0	0
20801040/6	212	181
20801040/7	0	0
20801040/8	0	0
20801040/9	402	386
20801040/10	513	507

20801120/1	333	328
20801120/2	0	0
20801120/3	110	93
20801120/4	284	270
20801140/1	18	16
21001141	0	0
21001142	0	0
21401100/1	0	0
21401100/2	527	495
21601060	0	0
21801080	0	0
21801100	0	0
Total	**18358**	**16278**

State Route 1 Land Use/Transportation Study

Technical Memorandum

D. Expanded Development District Land Use Scenario Trip Generation

Prepared For:
Delaware Department of Transportation

Prepared By:
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1. Introduction:

The purpose of this technical memorandum is to present the trip generation calculations and trip generation by TAZs for the Expanded Development District Scenario.

2. Trip Generation Calculations:

Table 1 shows the trip generation details for the vacant parcels and farmlands as per the Expanded Development District Scenario densities. It also shows the number of entering / exiting trips for each of these parcels. The 6th Edition of the Institution of Transportation Engineers' (ITE) Trip Generation Manual has been used to estimate generated trips.

3. Total Trip Generation by Study Area TAZs:

Table 2 shows the entering and exiting trips associated with the Base Land Use Scenario by study area TAZs.

Table 3 shows the entering and exiting trips for the vacant parcels and farmlands (for the Expanded Development District Scenario) by study area TAZs.

Table 4 shows the total entering and exiting trips by study area TAZs for the Expanded Development District Scenario. These trips are calculated by adding Table 2 and Table 3.

Table 1: Trip Generation for Vacant Parcels and Farmlands
Expanded Development District Scenario

Map #	Map Parcel #	Status Code	Zoning	Within Dev.District Codes: 4=Yes, 2=No	TAZ #	Area (acres)	Units	Trip Gen.	Entering Trips	Exiting Trips
3-34-1	9	Vacant	AR-1	2	18801200	391.17	782	735	397	338
3-34-1	15.02	Vacant	AR-1	2	18801200	3.74	7	7	4	3
3-34-1	15.03	Vacant	AR-1	2	18801200	3.74	7	7	4	3
3-34-1	16	Vacant	AR-1	2	18801200	1.23	2	2	1	1
3-34-1	16.01	Vacant	AR-1	2	18801200	0.24	1	1	1	0
3-34-1	16.05	Vacant	AR-1	2	18801200	1.27	3	2	1	1
3-34-1	16.07	Vacant	AR-1	2	18801200	1.23	2	2	1	1
3-34-1	16.08	Vacant	AR-1	2	18801200	1.23	2	2	1	1
3-34-1	16.09	Vacant	AR-1	2	18801200	1.23	2	2	1	1
3-34-1	16.1	Vacant	AR-1	2	18801200	1.23	2	2	1	1
3-34-1	27.01	Vacant	AR-1	2	18801200	4.94	10	9	5	4
3-34-1	4	Vacant	C-1		18801200	2.43		201	102	98
3-34-1	6.07	Vacant	C-1		18801200	1.07		88	45	43
3-34-1	6.01	Vacant	C-1		18801200	1.00		83	42	40
3-34-1	6.06	Vacant	C-1		18801200	1.35		111	57	55
3-34-1	6	Vacant	C-1		18801200	1.34		111	56	54
3-34-11	3.01	Farmland	AR-1	2	19001120	46.41	93	87	47	40
3-34-11	5	Farmland	AR-1	2	19001120	248.75	498	468	253	215
3-34-11	7	Farmland	AR-1	2	19001120	21.13	42	40	21	18
3-34-11	7.03	Farmland	AR-1	2	19001120	21	42	39	21	18
3-34-11	7.04	Farmland	AR-1	2	19001120	32.07	64	60	33	28
3-34-11	7.05	Farmland	AR-1	2	19001120	10.94	22	21	11	9
3-34-11	8	Farmland	AR-1	2	19001120	44.1	88	83	45	38
3-34-11	12	Vacant	GR	2	19001120	0.53	1	1	1	0
3-34-11	13	Vacant	GR	2	19001120	0.81	2	2	1	1
3-34-11	20	Farmland	GR	4	19001120	6.13	25	23	12	11
3-34-11	21	Farmland	AR-1	2	19001120	17.15	34	32	17	15
3-34-11	22	Farmland	AR-1	2	19001120	17.2	34	32	17	15
3-34-11	Adjoining 22	Farmland	AR-1	2	19001120	28.2	56	53	29	24
3-34-11	25	Farmland	GR	4	19001120	10.72	43	40	22	19
3-34-11	**46/1**	**Farmland**	**AR-1**	**4**	**19601120**	12.6	50	47	26	22

3-34-11	46/2	Farmland	AR-1		2	19601120	40	80	75	41	35
3-34-11	Adjoining 47	Vacant	AR-1		2	19601120	0.6	1	1	1	0
3-34-11	Adjoining 47	Vacant	AR-1		2	19601120	0.6	1	1	1	0
3-34-11	Adjoining 47	Vacant	AR-1		2	19601120	0.6	1	1	1	0
3-34-11	Adjoining 47	Vacant	AR-1		2	19601120	0.4	1	1	1	0
3-34-11	49	Vacant	AR-1		2	19601120	2.53	5	5	3	2
3-34-11	81	Farmland	AR-1		2	19601120	48.33	97	91	49	42
3-34-11	81.01	Vacant	AR-1		2	19601120	0.75	1	1	1	0
3-34-11	81.02	Vacant	AR-1		2	19601120	0.75	1	1	1	0
3-34-11	81.03	Vacant	AR-1		2	19601120	0.75	1	1	1	0
3-34-11	81.04	Vacant	AR-1		2	19601120	0.75	1	1	1	0
3-34-11	83	Farmland	AR-1		2	19401080/2	97.4	195	183	99	84
3-34-11	86	Farmland	AR-1		2	19401080/2	39.2	78	74	40	34
3-34-11	98.01	Vacant	GR		4	19401080/2	0.14	1	1	1	0
3-34-11	98.02	Vacant	GR		4	19401080/2	0.14	1	1	1	0
3-34-11	28	Vacant	GR		2	19401140/2	0.14	1	1	1	0
3-34-11	29	Farmland	AR-1		2	19401140/2	32.44	65	61	33	28
3-34-11	30	Vacant	GR		2	19401140/2	3	6	6	3	3
3-34-11	31	Vacant	GR		2	19401140/2	0.12	1	1	1	0
3-34-11	41	Vacant	GR		2	19401140/2	0.69	1	1	2	-1
3-34-11	42	Vacant	AR-1		2	19401140/2	9.4	19	18	10	8
3-34-11	43	Farmland	AR-1		2	19401140/2	53.45	107	100	54	46
3-34-11	43.01	Farmland	AR-1		2	19401140/2	35	70	66	36	30
3-34-11	45	Farmland	AR-1		2	19401140/2	61.7	123	116	63	53
3-34-12	2	Farmland	AR-1		4	19601120	12.46	50	47	25	22
3-34-12	3.01	Farmland	AR-1		4	19601120	8.89	36	33	18	15
3-34-12	**5**	**Farmland**	**AR-1**		**4**	**19601120**	27.18	109	102	55	47
3-34-12	**6**	**Farmland**	**AR-1**		**4**	**19601120**	48.8	195	183	99	84
3-34-12	**6.01/1**	**Farmland**	**AR-1**		**4**	**19601120**	22	88	83	45	38
3-34-12	6.01/2	Farmland	AR-1		2	19601120	15.88	32	30	16	14
3-34-12	8	Vacant	AR-1		2	19601120	4	8	8	4	3
3-34-12	9	Vacant	AR-1		2	19601120	1	2	2	1	1
3-34-12	10.01	Vacant	AR-1		2	19601120	2.4	5	5	3	2
3-34-12	11	Vacant	AR-1		2	19601120	1.04	2	2	1	1
3-34-12	13/1	Farmland	AR-1		2	19601120	93.66	187	176	95	81
3-34-12	**13/2**	**Farmland**	**AR-1**		**4**	**19601120**	40	160	150	81	69
3-34-12	13.01	Farmland	AR-1		2	19601120	66.84	134	126	68	58

3-34-12	**46**	**Farmland**	**AR-1**	**4**	**20201120**	37.11	148	140	75	64
3-34-12	**47**	**Farmland**	**AR-1**	**4**	**20201120**	40.7	163	153	83	70
3-34-12	48.02	Vacant	AR-1	2	20201120	0.53	1	1	1	0
3-34-12	48.03	Vacant	AR-1	2	20201120	0.03	1	1	1	0
3-34-12	50	Vacant	AR-1	2	20201120	1	2	2	1	1
3-34-12	**51**	**Vacant**	**AR-1**	**4**	**20201120**	4.7	19	18	10	8
3-34-12	**52**	**Farmland**	**AR-1**	**4**	**20201120**	124.5	498	468	253	215
3-34-12	**57.01**	**Farmland**	**AR-1**	**4**	**20201120**	8.76	35	33	18	15
3-34-12	57.04	Farmland	AR-1	4	20201120	32.79	131	123	67	57
3-34-12	57	Farmland	AR-1	4	20601140	33.85	135	127	69	59
3-34-12	123.01	Vacant	AR-1	4	20601140	8.94	18	17	9	8
3-34-12	123.02/1	Vacant	B-1		20601140	1	4	2	1	1
3-34-12	123.02/2	Farmland	AR-1	4	20601140	22.55	90	85	46	39
3-34-12	125	Farmland	AR-1	4	20601140	16.25	65	61	33	28
3-34-12	127.01	Farmland	AR-1	4	20601140	55.66	223	209	113	96
3-34-12	15.07	Vacant	GR	4	19401080/2	0.43	2	2	1	1
3-34-12	16/1	Farmland	GR	4	19401080/2	84.35	337	317	171	146
3-34-12	16/2	Farmland	AR-1	2	19401080/2	239.84	480	451	243	207
3-34-12	17	Farmland	AR-1	2	19401080/2	67.4	135	127	68	58
3-34-12	17.01	Vacant	AR-1	2	19401080/2	0.5	1	1	1	0
3-34-12	19	Farmland	AR-1	2	19401080/2	51	102	96	52	44
3-34-12	22	Farmland	AR-1	2	19401080/2	6	12	11	6	5
3-34-12	44	Vacant	AR-1	2	19401080/2	0.28	1	1	1	0
3-34-12	45.01	Vacant	AR-1	2	19401080/2	0.63	1	1	1	0
3-34-12	**46.01**	**Farmland**	**AR-1**	**4**	**20201040/1**	46.24	185	174	94	80
3-34-12	**113**	**Farmland**	**AR-1**	**4**	**20201040/1**	197	788	741	400	341
3-34-12	**116**	**Farmland**	**AR-1**	**4**	**20201040/1**	43	172	162	87	74
3-34-12	**122.03**	**Farmland**	**AR-1**	**4**	**20201040/2**	34.65	139	130	70	60
3-34-13	334	Farmland	MR	4	20601120/4	51.67	207	194	105	89
3-34-13	334.01	Farmland	MR	4	20601120/4	60.23	241	226	122	104
3-34-13	334.02	Farmland	MR	4	20601120/4	27.25	109	102	55	47
3-34-13	334.03	Farmland	MR	4	20601120/4	15	60	56	30	26
3-34-13	334.04	Farmland	MR	4	20601120/4	15	60	56	30	26
3-34-13	335	Farmland	AR-1	4	20601120/4	8.47	34	32	17	15
3-34-13	325.18	Vacant	C-1		20801040/10	11.66		963	491	472
3-34-13	164.01	Vacant	AR-1	4	20801040/2	0.68	3	3	2	1
3-34-13	171.01	Vacant	AR-1	4	20801040/2	1.51	6	6	3	3

3-34-13	171.02	Vacant	AR-1	4	20801040/2	1.25	5	5	3	2
3-34-13	185.01	Vacant	AR-1	4	20801040/2	0.5	2	2	1	1
3-34-13	325.07	Vacant	MR	4	20801040/6	1.98	8	8	4	4
3-34-13	319	Vacant	C-1		20801040/9	0.46		38	19	19
3-34-13	325.01	Vacant	C-1		20801040/9	4.83		399	203	195
3-34-13	325.24	Vacant	C-1		20801040/9	4.25		351	179	172
3-34-13	3	Vacant	C-1		20801120/1	0.5		41	21	20
3-34-13	8.04	Vacant	C-1		20801120/1	0.62		51	26	25
3-34-13	325	Farmland	AR-1	4	20801120/3	41.4	166	156	84	72
3-34-13	341	Vacant	AR-1	4	20801120/3	1	4	4	2	2
3-34-13	342	Vacant	AR-1	4	20801120/3	5.45	22	20	11	9
3-34-13	343	Vacant	AR-1	4	20801120/3	6.16	25	23	13	11
3-34-13	325.41	Vacant	C-1		20801120/4	0.6		50	25	24
3-34-13	106.01	Vacant	GR	4	20801140/1	0.41	2	2	1	1
3-34-13	325.08	Vacant	C-1		21401100/2	2.37		196	100	96
3-34-13	325.14	Vacant	C-1		21401100/2	2.35		194	99	95
3-34-13	325.15	Vacant	C-1		21401100/2	2.4		198	101	97
3-34-13	325.28	Vacant	AR-1	4	21401100/2	3.19	13	12	6	6
3-34-13	356	Vacant	C-1		21401100/2	0.6		50	25	24
3-34-13	360	Vacant	C-1		21401100/2	3.7		305	156	150
3-34-18	2	Farmland	AR-1	2	19401080/1	72.42	145	136	74	63
3-34-18	8	Vacant	MR	4	19401080/1	0.45	2	2	1	1
3-34-18	13	Farmland	AR-1	2	19401080/1	22.03	44	41	22	19
3-34-18	14	Vacant	MR	4	19401080/1	0.3	1	1	1	0
3-34-18	15	Vacant	MR	4	19401080/1	0.37	1	1	1	0
3-34-18	16	Vacant	MR	4	19401080/1	0.32	1	1	1	0
3-34-18	17	Vacant	MR	4	19401080/1	0.3	1	1	1	0
3-34-18	42/1	Farmland	AR-1	2	20201040/1	22.4	45	42	23	19
3-34-18	**42/2**	**Farmland**	**AR-1**	**2**	**20201040/1**	223.92	448	421	227	194
3-34-18	42.02	Vacant	AR-1	4	20201040/1	1.68	7	6	3	3
3-34-18	43	Farmland	AR-1	**2**	20201040/1	170	340	320	173	147
3-34-18	31	Vacant	AR-1	4	20201040/3	3.84	15	14	8	7
3-34-18	38.05	Vacant	AR-1	4	20201040/3	2.16	9	8	4	4
3-34-18	40.01	Farmland	AR-1	2	20201040/3	36.3	73	68	37	31
3-34-18	564	Vacant	AR-1	4	20201040/3	1.05	4	4	2	2
3-34-18	565	Vacant	AR-1	4	20201040/3	1.08	4	4	2	2
3-34-18	566	Vacant	AR-1	4	20201040/3	2.41	10	9	5	4

3-34-18	567	Vacant	AR-1	4	20201040/3	1.31	5	5	3	2
3-34-18	568	Vacant	AR-1	4	20201040/3	1.48	6	6	3	3
3-34-18	569	Vacant	AR-1	4	20201040/3	1.48	6	6	3	3
3-34-18	570	Vacant	AR-1	4	20201040/3	1.78	7	7	4	3
3-34-18	571	Vacant	AR-1	4	20201040/3	2.16	9	8	4	4
3-34-18	572	Vacant	AR-1	4	20201040/3	2.19	9	8	4	4
3-34-18	573	Vacant	AR-1	4	20201040/3	1.79	7	7	4	3
3-34-18	574	Vacant	AR-1	4	20201040/3	1.54	6	6	3	3
3-34-18	575	Vacant	AR-1	4	20201040/3	1.91	8	7	4	3
3-34-18	576	Vacant	AR-1	4	20201040/3	1.46	6	5	3	3
3-34-18	577	Vacant	AR-1	4	20201040/3	1.7	7	6	3	3
3-34-18	578	Vacant	AR-1	4	20201040/3	1.73	7	7	4	3
3-34-18	579	Vacant	AR-1	4	20201040/3	1.53	6	6	3	3
3-34-18	581	Vacant	AR-1	4	20201040/3	1.07	4	4	2	2
3-34-18	582	Vacant	AR-1	4	20201040/3	1.06	4	4	2	2
3-34-18	41	Vacant	AR-1	2	20201040/4	2.26	5	4	2	2
3-34-18	47	Vacant	AR-1	4	20201040/4	1	4	4	2	2
3-34-18	48	Vacant	AR-1	4	20201040/4	0.17	1	1	1	0
3-34-18	78	Vacant	AR-1	4	20201040/4	3.8	15	14	8	7
3-34-18	200	Vacant	AR-1	4	20201040/4	3.18	13	12	6	6
3-34-18	**416**	**Farmland**	**AR-1**	**2**	**20801040/4**	36.6	73	69	37	32
3-34-18	**417**	**Farmland**	**AR-1**	**2**	**20801040/4**	32.8	66	62	33	28
3-34-18	**418**	**Farmland**	**AR-1**	**2**	**20801040/4**	45.9	92	86	47	40
3-34-19	10	Vacant	AR-1	4	20801040/3	0.19	1	1	1	0
3-34-19	13.03	Vacant	AR-1	4	20801040/3	0.22	1	1	1	0
3-34-19	13.04	Vacant	AR-1	4	20801040/3	0.22	1	1	1	0
3-34-19	18	Vacant	AR-1	4	20801040/3	0.1	1	1	1	0
3-34-19	20.01	Vacant	AR-1	4	20801040/3	0.2	1	1	1	0
3-34-19	21.01	Vacant	AR-1	4	20801040/3	0.1	1	1	1	0
3-34-19	21.04	Vacant	AR-1	4	20801040/3	0.32	1	1	1	1
3-34-19	21.07	Vacant	AR-1	4	20801040/3	0.08	1	1	1	0
3-34-19	21.08	Vacant	AR-1	4	20801040/3	1.67	7	6	3	3
3-34-19	21.1	Vacant	AR-1	4	20801040/3	0.44	2	2	1	1
3-34-19	21.6	Vacant	AR-1	4	20801040/3	0.39	2	1	1	0
3-34-19	**1.03**	**Farmland**	**AR-1**	**2**	**20801040/4**	82.6	165	155	84	71
3-34-19	**1.05**	**Farmland**	**AR-1**	**2**	**20801040/4**	59.2	118	111	60	51
3-34-19	154.01	Pending	MR	4	20801040/6	19	76	71	39	33

3-34-19	380.01	Vacant	MR	4	20801040/6	25.58	102	96	52	44
3-34-19	380.02	Vacant	MR	4	20801040/6	2.4	10	9	5	4
3-34-19	380.03	Vacant	MR	4	20801040/6	2.28	9	9	5	4
3-34-19	380.04	Vacant	MR	4	20801040/6	2.28	9	9	5	4
3-34-5	168	Vacant	AR-1	2	18201180	11.96	24	22	12	10
3-34-5	72.03	Vacant	AR-1	2	18801200	8.03	16	15	8	7
3-34-5	72.02	Farmland	AR-1	2	18801200	15.32	31	29	16	13
3-34-5	174	Farmland	AR-1	2	18601120/2	102.23	204	192	104	88
3-34-5	175/1	Farmland	AR-1	2	18601120/2	401.72	803	755	408	347
3-34-5	176	Vacant	AR-1		18601120/2	3.32	7	7	4	3
3-34-5	**177/1**	**Farmland**	**AR-1**	**4**	**18601120/2**	63.53	254	239	129	110
3-34-5	180	Vacant	AR-1	2	18601120/2	0.43	1	1	1	0
3-34-5	141	Vacant	C-1		18801180/1	2.44		201	103	99
3-34-5	143	Vacant	C-1		18801180/1	1.9		157	80	77
3-34-5	144.01	Vacant	C-1		18801180/1	0.43		36	18	17
3-34-5	147	Vacant	C-1		18801180/1	0.83		69	35	34
3-34-5	152.02	Vacant	C-1		18801180/1	1.32		109	56	53
3-34-5	152.03	Vacant	C-1		18801180/1	0.46		38	19	19
3-34-5	70	Farmland	AR-1	4	18801180/2	109.66	439	412	223	190
3-34-5	153	Farmland	AR-1	4	18801180/2	61.39	246	231	125	106
3-34-5	225.02	Vacant	AR-1	4	19401140/1	5.05	20	19	10	9
3-34-5	175/2	Farmland	AR-1	4	19401140/2	17.92	72	67	36	31
3-34-5	177/2	Farmland	AR-1	4	19401140/2	17.5	70	66	36	30
3-34-5	222.01	Vacant	AR-1	4	19401140/2	19.53	78	73	40	34
3-34-5	78	Vacant	C-1		19401180/2	0.42		35	18	17
3-34-5	80.02	Vacant	C-1		19401180/2	0.29		24	12	12
3-34-5	88	Vacant	C-1		19401180/2	0.76		63	32	31
3-34-5	90	Vacant	C-1		19401180/2	2.33		192	98	94
3-34-6	550	Vacant	AR-1	4	19601120	0.76	3	3	2	1
3-34-6	551.01	Vacant/Farm	AR-1	4	19601120	15	60	56	30	26
3-34-6	**552**	**Farmland**	**AR-1**	**4**	**19601120**	11.2	45	42	23	19
3-34-6	1257	Vacant	AR-1	2	19601120	0.48	1	1	1	0
3-34-6	1299	Vacant	AR-1	4	19401140/1	0.66	3	2	1	1
3-34-6	687	Vacant	C-1		19801160/1	6.49		536	273	263
3-34-6	500	Vacant	AR-1	4	19801160/2	2.9	12	11	6	5
3-34-6	502	Vacant	AR-1	4	19801160/2	0.7	3	3	2	1
3-34-6	503	Farmland	AR-1	4	19801160/2	26.36	105	99	54	46

3-34-6	504.02	Vacant	AR-1	4	19801160/2	10.5	42	39	21	18
3-34-6	504.05	Vacant	AR-1	4	19801160/2	1.88	8	7	4	3
3-34-6	504.06	Vacant	AR-1	4	19801160/2	1	4	4	2	2
3-34-6	511	Vacant	AR-1	4	19801160/2	4.92	20	18	10	9
3-34-6	511.04	Vacant	AR-1	4	19801160/2	0.16	1	1	1	0
3-34-6	523	Vacant/Farm	AR-1	4	19801160/2	14.62	58	55	30	25
3-34-6	526/2	Vacant	AR-1	4	19801160/2	20.81	83	78	42	36
3-34-6	683	Vacant	AR-1	4	19801160/2	0.44	2	2	1	1
3-34-6	686	Vacant	AR-1	4	19801160/2	0.44	2	2	1	1
3-34-6	490	Vacant	C-1		19801160/3	0.66		54	28	27
3-34-6	497	Vacant	C-1		19801160/3	20.71		1710	872	838
3-34-6	4.03	Vacant	C-1		19801180/1	0.6		50	25	24
3-34-6	4.04	Vacant	C-1		19801180/1	0.4		33	17	16
3-34-6	23	Vacant	C-1		19801180/1	5.19		429	219	210
3-34-6	36	Vacant	C-1		19801180/1	0.2		17	8	8
3-34-6	37	Vacant	C-1		19801180/1	0.4		33	17	16
3-34-6	39/1	Farmland	C-1		19801180/1	14.09		1163	593	570
3-34-6	39/2	Farmland	AR-1	4	19801180/2	28.18	113	106	57	49
3-34-6	55	Vacant	AR-1	4	19801180/2	9.73	39	37	20	17
3-34-6	56	Vacant	AR-1	4	19801180/2	5.2	21	20	11	9
3-34-6	57	Vacant	AR-1	4	19801180/2	6.6	26	25	13	11
3-34-6	58	Vacant	AR-1	4	19801180/2	0.8	3	3	2	1
3-34-6	59	Vacant	AR-1	4	19801180/2	0.2	1	1	1	0
3-34-6	60	Vacant	AR-1	4	19801180/2	0.2	1	1	1	0
3-34-6	61	Vacant	AR-1	4	19801180/2	0.4	2	2	1	1
3-34-6	62	Vacant	AR-1	4	19801180/2	3.52	14	13	7	6
3-34-6	63.03	Vacant	C-1		19801180/2	1.58		130	67	64
3-34-6	63.04	Vacant	AR-1	4	19801180/2	0.8	3	3	2	1
3-34-6	70	Vacant	MR-RPC		20401160/2	6.5	26	24	13	11
3-34-6	66.02	Vacant/Farm	AR-1	4	20401160/3	26.29	105	99	54	45
3-34-6	68	Vacant	AR-1	4	20401160/3	2.58	10	10	5	5
3-34-7	3	Vacant	GR	4	20401160/2	0.18	1	1	1	0
3-34-7	12.04	Vacant	GR	4	20401160/2	0.5	2	2	1	1
3-34-7	16.02	Vacant	AR-1	4	20801140/1	0.41	2	2	1	1
3-35-11	55	Vacant	AR-1	4	19401180/2	7.55	30	28	15	13
3-35-11	56	Vacant	AR-1	4	19401180/2	13.42	54	50	27	23
3-35-11	59	Vacant	AR-1	4	19401180/2	19.55	78	74	40	34

3-35-12	3	Farmland	AR-1	4	20401160/3	490.36	1961	1844	996	848
3-35-7	6	Farmland	AR-1	2	18801200	82.88	166	156	84	72
3-35-7	7.02	Vacant	AR-1	2	18801200	3.09	6	6	3	3
3-35-7	7.04	Vacant	AR-1	2	18801200	2.48	5	5	3	2
3-35-7	34	Vacant	AR-1	2	18801200	1.00	2	2	1	1
3-35-7	35	Vacant	AR-1	2	18801200	1.00	2	2	1	1
3-35-7	36	Vacant	AR-1	2	18801200	1.00	2	2	1	1
3-35-7	37	Vacant	AR-1	2	18801200	1.00	2	2	1	1
3-35-7	38	Vacant	AR-1	2	18801200	1.00	2	2	1	1
3-35-7	part 1	Farmland	AR-1	2	18801200	160.00	320	301	162	138
3-35-8	2	Vacant	AR-1	2	18801200	138.06	276	260	140	119
3-35-8	27.06	Vacant	AR-1	4	19801200	1.64	7	6	3	3
3-35-8	27.03	Vacant	AR-1	4	19801200	1.76	7	7	4	3
3-35-8	27.05	Vacant	AR-1	4	19801200	1.80	7	7	4	3
3-35-8	27.04	Vacant	AR-1	4	19801200	7.66	31	29	16	13
3-35-8	27.07	Vacant	AR-1	4	19801200	10.00	40	38	20	17
3-35-8	27.09	Vacant	AR-1	4	19801200	11.30	45	42	23	20
3-35-8	27.08	Vacant	AR-1	4	19801200	9.10	36	34	18	16
3-35-8	part 26	Farmland	AR-1	4	19801200	40.00	160	150	81	69
3-35-8	43	Farmland	AR-1	4	20401220	95.86	383	360	195	166
3-35-8	51	Farmland	AR-1	4	20401240	43.71	175	164	89	76
3-35-8	part 53	Farmland	AR-1	4	20401240	45.00	180	169	91	78
3-35-8	50.02	Vacant	AR-1	4	20401240	4.68	19	18	10	8
3-35-8	46	Farmland	AR-1	4	20401240	24.00	96	90	49	42
3-35-8	47	Farmland	AR-1	4	20401240	8.00	32	30	16	14
3-35-8	48	Farmland	AR-1	4	20401240	16.00	64	60	32	28
3-35-8	36	Farmland	AR-1	4	20401240	12.71	51	48	26	22
3-35-9	1.01	Vacant	AR-1	4	20401240	22.50	90	85	46	39
3-35-9	9	Vacant	AR-1	4	20401240	8.51	34	32	17	15
							18103			
							TOTAL	25521	13538	11984

Note: All the parcels in bold are either newly included in the development district (parcels with Dev. Distric Code **4**) or downsized due to environmental constraints (parcels with Dev. Distric Code **2**).

Table 2 - Entering and Exiting Trips by TAZs for the Base Land Use Scenario

New SplitTAZ	Entering Trips	Exiting Trips
18201180	0	0
18601120/1	0	0
18601120/2	0	0
18801180/1	0	0
18801180/2	55	47
18801200	0	0
19001120	0	0
19401080/1	0	0
19401080/2	0	0
19401140/1	241	206
19401140/2	0	0
19401180/1	0	0
19401180/2	298	253
19601120	0	0
19801160/1	842	809
19801160/2	9	9
19801160/3	10	9
19801180/1	40	39
19801180/2	0	0
19801180/3	14	23
19801200	0	0
20201040/1	0	0
20201040/2	0	0
20201040/3	355	125
20201040/4	0	0
20201120	105	80
20401140/1	882	845
20401140/2	111	94
20401160/1	0	0
20401160/2	57	49
20401160/3	0	0
20401220	0	0
20401240	0	0
20601120/1	0	0
20601120/2	0	0
20601120/3	0	0
20601120/4	30	26
20601140	62	59
20801040/1	996	937
20801040/2	0	0
20801040/3	25	22
20801040/4	73	63
20801040/5	0	0
20801040/6	104	88
20801040/7	0	0
20801040/8	0	0
20801040/9	0	0
20801040/10	22	35

20801120/1	286	283
20801120/2	0	0
20801120/3	0	0
20801120/4	259	246
20801140/1	16	14
21001141	0	0
21001142	0	0
21401100/1	0	0
21401100/2	40	27
21601060	0	0
21801080	0	0
21801100	0	0
Total	**4932**	**4388**

Table 3 - Entering and Exiting Trips by TAZs for Vacant Parcels and Farmlands
Expanded Deveopment District Scenario

New SplitTAZ	Entering Trips	Exiting Trips
18201180	12	10
18601120/1	0	0
18601120/2	646	547
18801180/1	311	299
18801180/2	347	296
18801200	1142	1006
19001120	530	451
19401080/1	101	83
19401080/2	683	582
19401140/1	12	10
19401140/2	313	263
19401180/1	0	0
19401180/2	242	224
19601120	688	586
19801160/1	273	263
19801160/2	173	145
19801160/3	900	865
19801180/1	879	845
19801180/2	181	159
19801180/3	0	0
19801200	169	144
20201040/1	1007	858
20201040/2	70	60
20201040/3	107	91
20201040/4	19	15
20201120	507	432
20401140/1	0	0
20401140/2	0	0
20401160/1	0	0
20401160/2	15	12
20401160/3	1055	898
20401220	195	166
20401240	376	320
20601120/1	0	0
20601120/2	0	0
20601120/3	0	0
20601120/4	361	307
20601140	271	231
20801040/1	0	0
20801040/2	9	6
20801040/3	11	5
20801040/4	261	222
20801040/5	0	0
20801040/6	108	93
20801040/7	0	0
20801040/8	0	0
20801040/9	402	386
20801040/10	491	472

20801120/1	47	45
20801120/2	0	0
20801120/3	110	93
20801120/4	25	24
20801140/1	2	2
21001141	0	0
21001142	0	0
21401100/1	0	0
21401100/2	487	468
21601060	0	0
21801080	0	0
21801100	0	0
Total	**13538**	**11984**

Table 4 - Total Entering and Exiting Trips by TAZs for the Expanded Development District Scenario

New SplitTAZ	Entering Trips	Exiting Trips
18201180	12	10
18601120/1	0	0
18601120/2	646	547
18801180/1	311	299
18801180/2	402	343
18801200	1142	1006
19001120	530	451
19401080/1	101	83
19401080/2	683	582
19401140/1	253	216
19401140/2	313	263
19401180/1	0	0
19401180/2	540	477
19601120	688	586
19801160/1	1115	1072
19801160/2	182	154
19801160/3	910	874
19801180/1	919	884
19801180/2	181	159
19801180/3	14	23
19801200	169	144
20201040/1	1007	858
20201040/2	70	60
20201040/3	462	216
20201040/4	19	15
20201120	612	512
20401140/1	882	845
20401140/2	111	94
20401160/1	0	0
20401160/2	72	61
20401160/3	1055	898
20401220	195	166
20401240	376	320
20601120/1	0	0
20601120/2	0	0
20601120/3	0	0
20601120/4	391	333
20601140	333	290
20801040/1	996	937
20801040/2	9	6
20801040/3	36	27
20801040/4	334	285
20801040/5	0	0
20801040/6	212	181
20801040/7	0	0
20801040/8	0	0
20801040/9	402	386
20801040/10	513	507

20801120/1	333	328
20801120/2	0	0
20801120/3	110	93
20801120/4	284	270
20801140/1	18	16
21001141	0	0
21001142	0	0
21401100/1	0	0
21401100/2	527	495
21601060	0	0
21801080	0	0
21801100	0	0
Total	**18470**	**16372**

State Route 1 Land Use/Transportation Study

Technical Memorandum

E. Land Assembly Exercise for the Activity Center Land Use Scenario

Prepared For:
Delaware Department of Transportation
DelDOT

Prepared By:
DMJM+HARRIS
516 East State Street
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I. Introduction:

The purpose of this technical memorandum is to explain the methodology used for accumulating vacant/farmland land parcels for each of the activity centers/villages (land assembly exercise), and to discuss the process used to decide the mix of developments at each activity center/village.

II. Land Assembly Exercise for the Activity Centers/Villages:

The size of each activity center has been determined based on its location in the expanded development district, available vacant land at/near the location and to achieve reasonable development density within the activity center. The following basic principles have been considered while conducting the land assembly exercise:

1. The overall development potential (i.e. total number of potential dwelling units) have been kept same as that of the Expanded Development District Scenario. The total number of potential dwelling units in the study area for the Activity Center Scenario will be 18,103 (same as that for the Expanded Development District Scenario).
2. The development potential of the study area has been maintained the same by balancing the compact high-density, mixed-use development within the activity centers with a low-density (1DU/acre) development on the parcels outside of the activity centers.
3. The land assembly exercise has been conducted on an iterative basis until a reasonable development density was achieved for each of the activity centers.

A. Land Assembly Exercise: 1st Iteration

During the first iteration of the land assembly exercise, 4 activity centers, as per the April 11th project team meeting, were considered. Tentative vacant parcels for each of the activity centers were identified as follows:

- **Activity Center between SR24 and Rd 274 adjacent to the school**

→ Tentative parcels

Parcel ID	Map #	Acreage
42/1	3-34-18	50.00
Part 1 of 43	3-34-18	30.00
46.01	3-34-12	46.24
113	3-34-12	197.00
	TOTAL	**323.24**

- **Activity Center between SR24 and Rd 274 adjacent to the Medical Center and Sea Chase Development**

→ Tentative parcels

Parcel ID	Map #	Acreage
57	3-34-12	33.85
127.01	3-34-12	55.66
125	3-34-12	16.25

123.02/2	3-34-12	22.55
Adjacent to 124 (Sea Chase II)	3-34-12	35.00
	TOTAL	**163.31**

- **Activity Center between SR23 and US9**
  → Tentative parcels

Parcel ID	Map #	Acreage
153	3-34-5	61.39
177/1	3-34-5	63.53
	TOTAL	**124.94**

- **Activity Center adjacent to Gill Neck Road**
  → Tentative parcels

Parcel ID	Map #	Acreage
3/1	3-35-12	190.00
37	3-35-8	57.98
43	3-35-8	95.86
	TOTAL	**343.84**

- **Details about the number of residential units:**

	Expanded Development District Scenario	Activity Center Village Scenario
Total number of new residential units on vacant land/ farmland	18,103	18,103
Number of new residential units on Activity Center parcels	-	12,546
Total number of new residential units on vacant land/ farmland parcels other than Activity Center parcels	-	5,557

<u>1st ITERATION ANALYSIS:</u>

The number of future residential units on the activity center parcels

= 12,546

Total Acreage of the tentative parcels selected for the proposed 4 Activity Centers

= 323.24 + 163.31 + 124.94 + 343.84

= 955.33 Acres

Thus, the average development density for the activity centers

= 12,546 units / 955.33 acres

= Approximately 13 residential units per acre on the activity center land; a rather high level of gross residential density compared to existing, mixed-use development/centers in the region.

B. Land Assembly Exercise: 2nd Iteration with One Additional Activity Center/Village

The average activity center development density achieved at the end of the first iteration (13 DU/acre) is high compared to pre-existing compact, mixed-use development within the study area. To reduce the activity center development density to a level more in line with existing, compact, mixed use development in the study area, another activity center was needed within the study area to capture more of the development potential. Based on the location within the expanded development district and availability of the vacant land parcels, a fifth activity center has been assumed at the intersection of Road 283 and Road 275.

Note: Highlighted Items show changes/additions to the first iteration of the Activity Center Land Assembly Exercise.

- **Activity Center between SR24 and Rd 274 adjacent to the school**
  → Tentative parcels

Parcel ID	Map #	Acreage
42/1	3-34-18	50.00
Part 1 of 43	3-34-18	30.00
46.01	3-34-12	46.24
113	3-34-12	197.00
	TOTAL	**323.24**

- **Activity Center between SR24 and Rd 274 adjacent to the Medical Center and Sea Chase Development**
  → Tentative parcels

Parcel ID	Map #	Acreage
57	3-34-12	33.85
127.01	3-34-12	55.66
125	3-34-12	16.25
123.02/2	3-34-12	22.55
Adjacent to 124 (Sea Chase II)	3-34-12	35.00
	TOTAL	**163.31**

- **Activity Center between SR23 and US9**
  → Tentative parcels

Parcel ID	Map #	Acreage
175/1	3-34-5	35.92

177/1	3-34-5	63.53
177/2	3-34-5	17.5
	TOTAL	**116.95**

- **Activity Center adjacent to Gill Neck Road**

→ Tentative parcels

Parcel ID	Map #	Acreage
3/1	3-35-12	190.00
37	3-35-8	57.98
43	3-35-8	95.86
	TOTAL	**343.84**

- **Activity Center at Rd 275 and Rd 283 adjacent to the Aydolotte Estate**

→ Tentative parcels

Parcel ID	Map #	Acreage
52	3-34-12	124.50
13/2	3-34-12	40.00
6/1	3-34-12	25.00
5	3-34-12	27.18
3.01	3-34-12	8.89
2	3-34-12	12.46
51	3-34-12	4.70
	TOTAL	**242.73**

- **Details about the number of residential units:**

	Expanded Development District Scenario	Activity Center Scenario
Total number of new residential units on vacant land/ farmland	18,103	18,103
Number of new residential units on Activity Center parcels	-	12,782
Total number of new residential units on vacant land/ farmland parcels other than Activity Center parcels	-	5,321

2nd ITERATION ANALYSIS:

The number of future residential units on the activity center parcels

= 12,782

Total Acreage of the tentative parcels selected for the proposed 5 Activity Centers

= 323.24 + 163.31 + 116.95 + 343.84 + 242.73

= 1190.07 Acres

Thus, the average development density for the activity centers

= 12,782 units / 1190.07 acres

= Approximately 11 residential units per acre on the activity center land; again a relatively high level of gross residential density compared to existing, mixed-use development/centers in the region.

C. Land Assembly Exercise: 3rd Iteration with Additional Acreage for Activity Centers/Villages

The average activity center development density achieved at the end of the second iteration (11 DU/acre) was still relatively high. To further reduce the activity center development density, additional acreage was added to the activity centers in this third and final iteration.

Note: Highlighted Items show changes/additions to the second iteration of the Activity Center Land Assembly Exercise.

- **Activity Center between SR24 and Rd 274 adjacent to the school**

→ Tentative parcels

Parcel ID	Map #	Acreage
42/1	3-34-18	50.00
Part 1 of 43	3-34-18	30.00
Part 2 of 43	3-34-18	20.00
46.01	3-34-12	46.24
113	3-34-12	197.00
47	3-34-12	40.70
41	3-34-18	2.26
	TOTAL	**386.20**

- **Activity Center between SR24 and Rd 274 adjacent to the Medical Center and Sea Chase Development**

→ Tentative parcels

Parcel ID	Map #	Acreage
57	3-34-12	33.85
127.01	3-34-12	55.66
125	3-34-12	16.25
123.02/2	3-34-12	22.55
Adjacent to 124 (Sea Chase II)	3-34-12	35.00
123.01	3-34-12	8.94
	TOTAL	**172.25**

- **Activity Center between SR23 and US9**

→ Tentative parcels

Parcel ID	Map #	Acreage

175/1	3-34-5	35.92
177/1	3-34-5	63.53
177/2	3-34-5	17.5
222.01	3-34-5	19.53
	TOTAL	**136.48**

- **Activity Center adjacent to Gill Neck Road**

  → Tentative parcels

Parcel ID	Map #	Acreage
3/1	3-35-12	190.00
37	3-35-8	57.98
43	3-35-8	95.86
46	3-35-8	24.00
	TOTAL	**367.84**

- **Activity Center at Rd 275 and Rd 283 adjacent to the Aydolotte Estate**

  → Tentative parcels

Parcel ID	Map #	Acreage
52	3-34-12	124.50
13/2	3-34-12	40.00
6	3-34-12	48.80
5	3-34-12	27.18
3.01	3-34-12	8.89
2	3-34-12	12.46
51	3-34-12	4.70
6.01/1	3-34-12	22.0
	TOTAL	**288.53**

- **Details about the number of residential units:**

	Expanded Development District Scenario	Activity Center Scenario
Total number of new residential units on vacant land/ farmland	18,103	18,103
Number of new residential units on Activity Center parcels	-	12,969
Total number of new residential units on vacant land/ farmland parcels other than Activity Center parcels	-	5,134

3rd ITERATION ANALYSIS:

The number of future residential units on the activity center parcels

= 12,969

Total Acreage of the tentative parcels selected for the proposed 5 Activity Centers

= 386.20 + 172.25 + 136.48 + 367.84 + 288.53

= 1351.30 Acres

Thus, the average development density for the activity centers

= 12,969 units / 1351.30 acres

= Approximately 9.6 residential units per acre on the activity center land.

The average development density for the activity centers achieved at the end of the third iteration (9.5DUs/acre) seems reasonable based on the following assumption:

- The proposed density for the activity centers is slightly more than double the existing density for the parcels (4DUs/acre) selected for the activity centers; thus more appropriately working as a receiving area for new development that could be transferred (as would occur in a transfer of development rights or credits program) from land outside the activity centers/villages.

III. Process for Deciding Potential Development Mix at Each Activity Center/Village:

As per the mixed-use concept of an activity center or village, the requirement for the retail/commercial space is mainly based on the demand from the residential component of the activity center or village. This means the retail and commercial space is largely geared to serving the activity center or village itself – a neighborhood shopping concept. Thus, the first step is to estimate the number of residential units in each of the activity centers/villages.

As per the third and final iteration of the land assembly exercise, the five activity centers should accommodate 12,969 residential units. The distribution of these residential units to the five activity centers has been done based on the size of each activity center. Thus, each of the five activity centers will have development density close to 9.6 DUs/acre. The distribution of residential units is shown in the following **Table 1**.

Table 1: Distribution of Dwelling Units Based on the Size of the Activity Centers

Activity Center	Location	Size (acres)	Target DU	Density (DUs/acre)
A1	Between SR24 & Rd274 adjacent to the School.	386.20	3700	9.58
A2	Between SR24 & Rd274 adjacent to the Medical Center	172.25	1660	9.64
A3	Between SR23 & US9.	136.48	1310	9.59
A4	Adjacent to Gill Neck Road (Near Lewes)	367.84	3525	9.58
A5	at the intersection of RD283 and RD275.	288.53	2775	9.62
	Total/Average	**1,351.30**	**12,970**	**9.60**

Development Mix for Each Activity Center/Village:

Once the target residential units within each activity center have been decided, the next step is to decide the development mix for each activity center. The following common assumptions have been made while working with the development mix for each of the activity centers:

- Due to the compactness of the activity centers and high number of target residential units in each activity center and the attractiveness of the study area to retirees, it has been assumed that all the dwelling units were not single family detached housing but a mix of two or three different types of residential units. Thus, for this exercise, the following three types of residential units have been considered:
    1. Single family detached housing with lot size 6,000 sq.ft. per unit.
    2. Condominium units with lot size 4,500 sq.ft. per unit.
    3. Apartment units with lot size 3,000 sq.ft. per unit for a building up to 24 units.

- Various proportions of each housing types were analyzed to achieve the target number of residential units in each activity center. Based on the results of this analysis, the available area for residential units in the each activity center was equally divided into three parts, (one for each housing type) and then number of dwelling units of each type of housing was calculated.

- Efforts were made to keep aside 5-10% (close to 5% in larger activity centers while close to 10% in smaller activity centers) of land in the each activity center for construction of internal roads and reserved green space.

- The retail/commercial space estimated for each activity center represents gross floor area (GFA). Usually, the GFA for a typical retail/commercial development is approximately 0.2 times the lot size but due to neighborhood nature of the activity center and assumed street front retail (with reduced parking requirement than a typical shopping mall), the GFA has been considered equal to 0.5 times the lot size. Based on the area constraints, retail/commercial development was also assumed to share the residential land (i.e. retail/commercial stores below low rise apartment buildings).

The following shows the process used to decide the development mix in the each activity center. The green polygons in the process flowchart show the final mix chosen to calculate the trip generation.

A. Activity Center (A1):

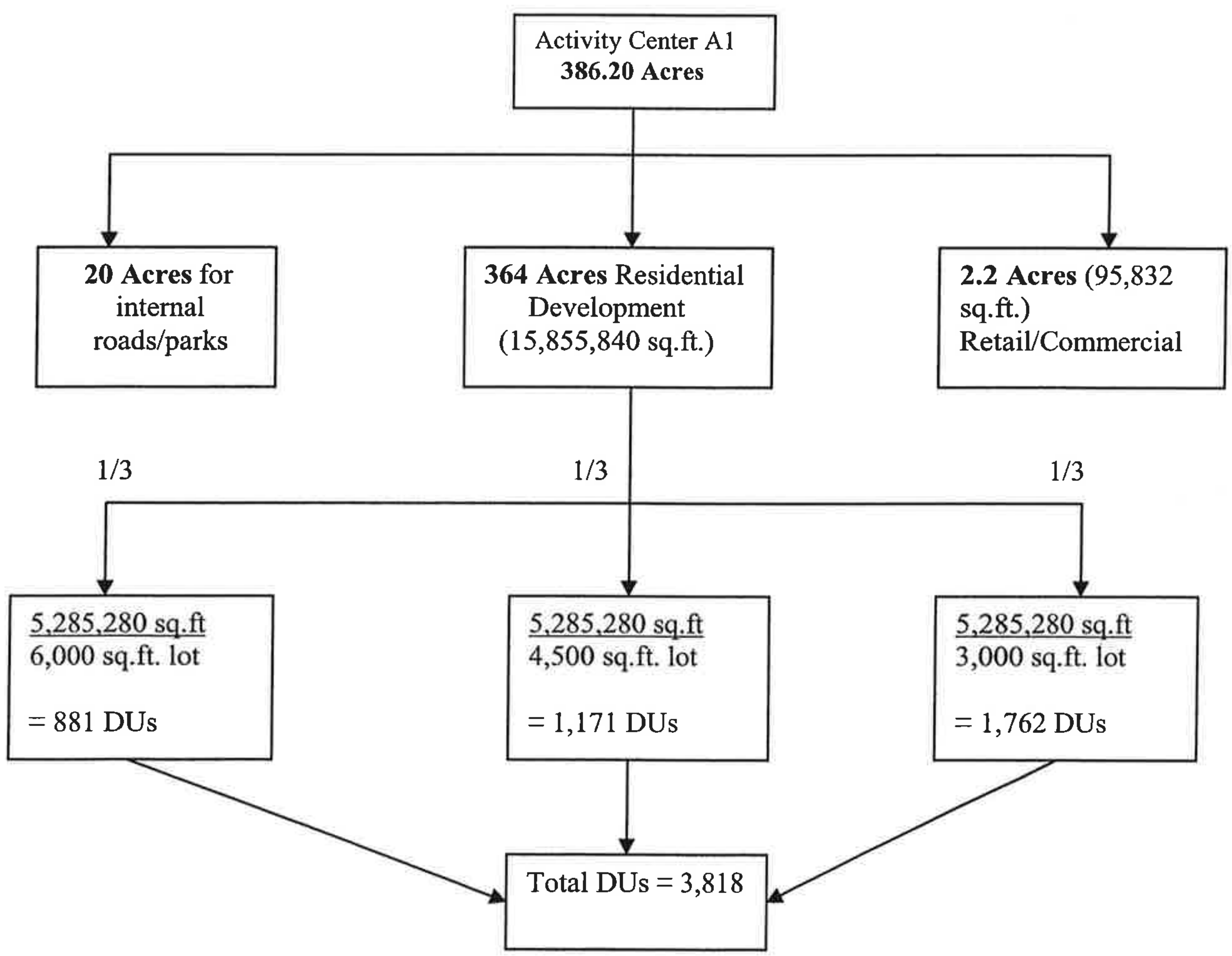
Step 1:

Geographic Location: Between SR24 & Rd274 adjacent to the School

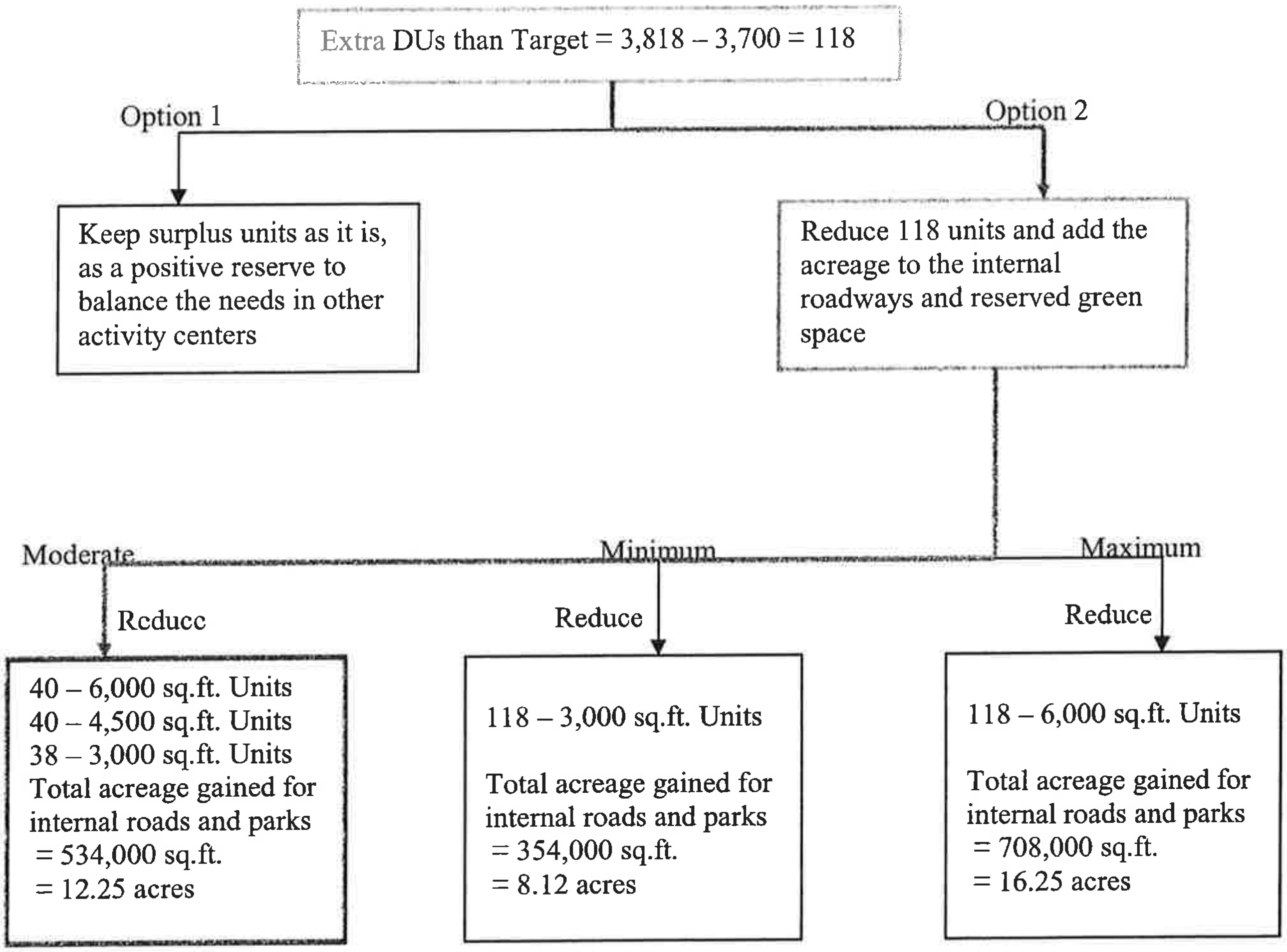
Target Dwelling Units: 3,700

Activity Center Area: 386.20 acres

Step 2:



Step 3:



Step 4:

Activity Center (A1) development mix used for calculating trip generation:

- 3,700 DUs
  → 841 Single Family detached units
  → 1135 Condominium units
  → 1724 Apartment units

- 2.2 acres (95,832 sq.ft.) of Retail/Commercial Development

- 32.25 acres of open space for internal roads/ parks etc.

B. Activity Center (A2):

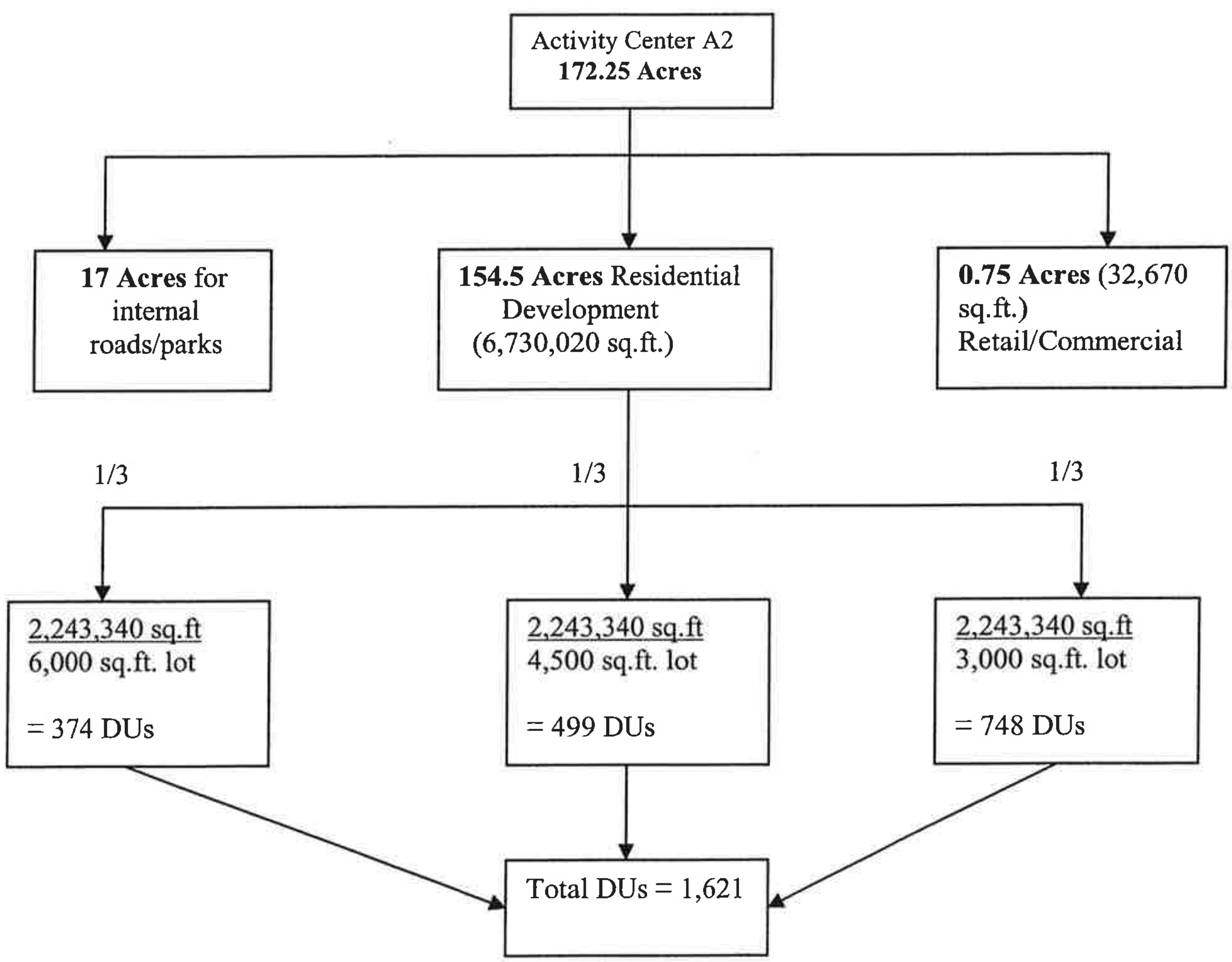
Step 1:

Geographic Location: Between SR24 & Rd274 adjacent to the Medical Center

Target Dwelling Units: 1,660

Activity Center Area: 172.25 acres

Step 2:



Step 3:

DUs Less than Target = 1,660 – 1,621 = 39

Option 1

Keep as it is, extra units in other activity centers will compensate the difference

Option 2

Change 1/3 – 1/3 – 1/3 split to create 1660 units. This can be done by replacing forty 6,000 - sq.ft. units by eighty 3,000-sq.ft units

Step 4:

Activity Center (A1) development mix used for calculating trip generation:

- 1,621 DUs
  → 374 Single Family detached units
  → 499 Condominium units
  → 748 Apartment units
- 0.75 acres (32,670 sq.ft.) of Retail/Commercial Development
- 17 acres of open space for internal roads/ parks etc.

C. Activity Center (A3):

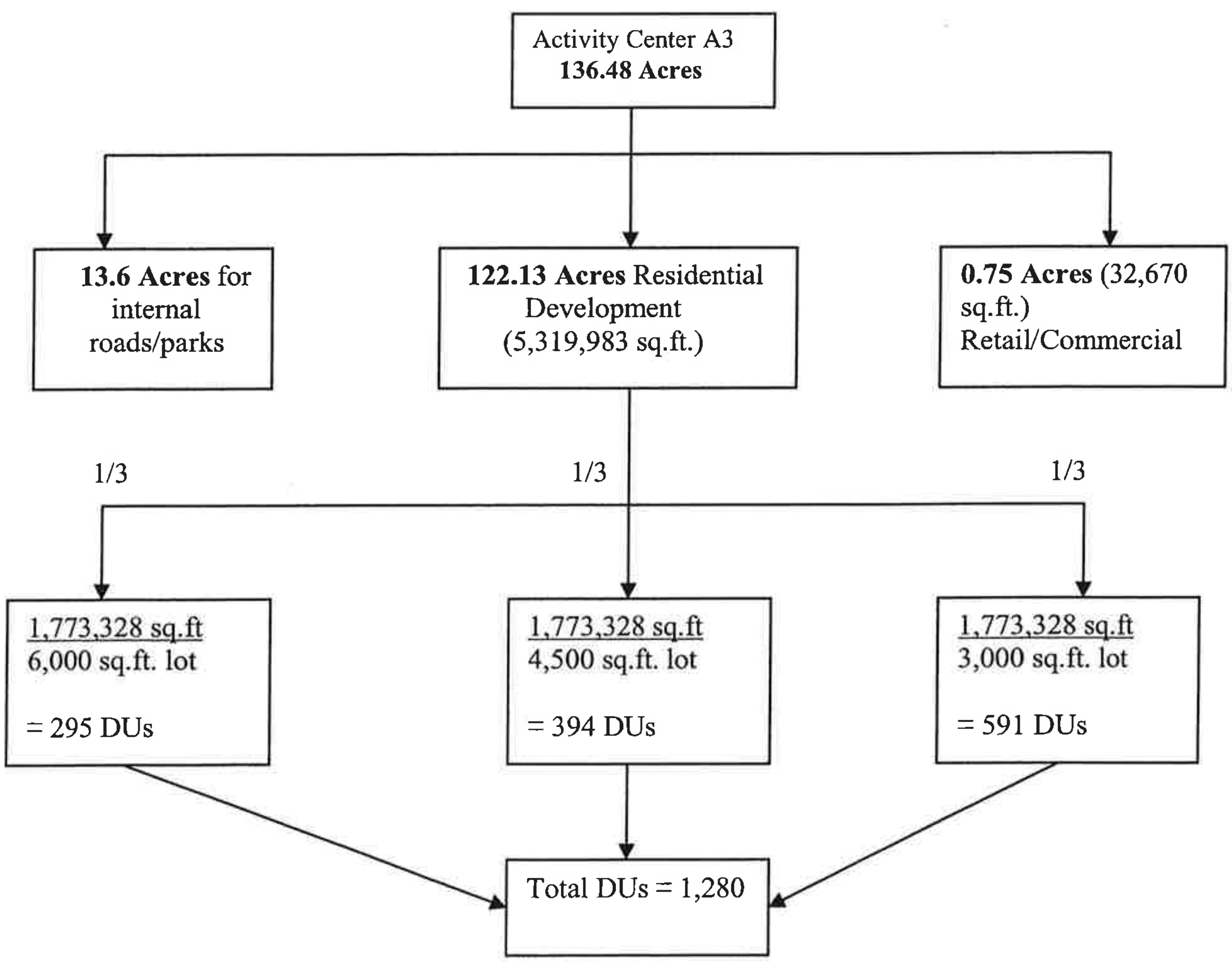
Step 1:

Geographic Location: Between SR23 & US9

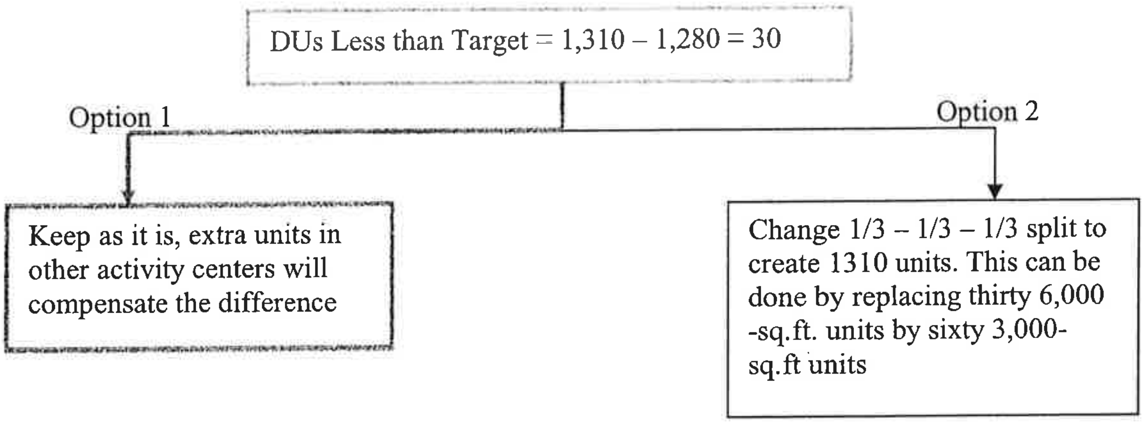
Target Dwelling Units: 1,310

Activity Center Area: 136.48 acres

Step 2:



Step 3:



Step 4:

Activity Center (A1) development mix used for calculating trip generation:

- 1,280 DUs
  → 295 Single Family detached units
  → 394 Condominium units
  → 591 Apartment units

- 0.75 acres (32,670 sq.ft.) of Retail/Commercial Development

- 13.6 acres of open space for internal roads/ parks etc.

D. Activity Center (A4):

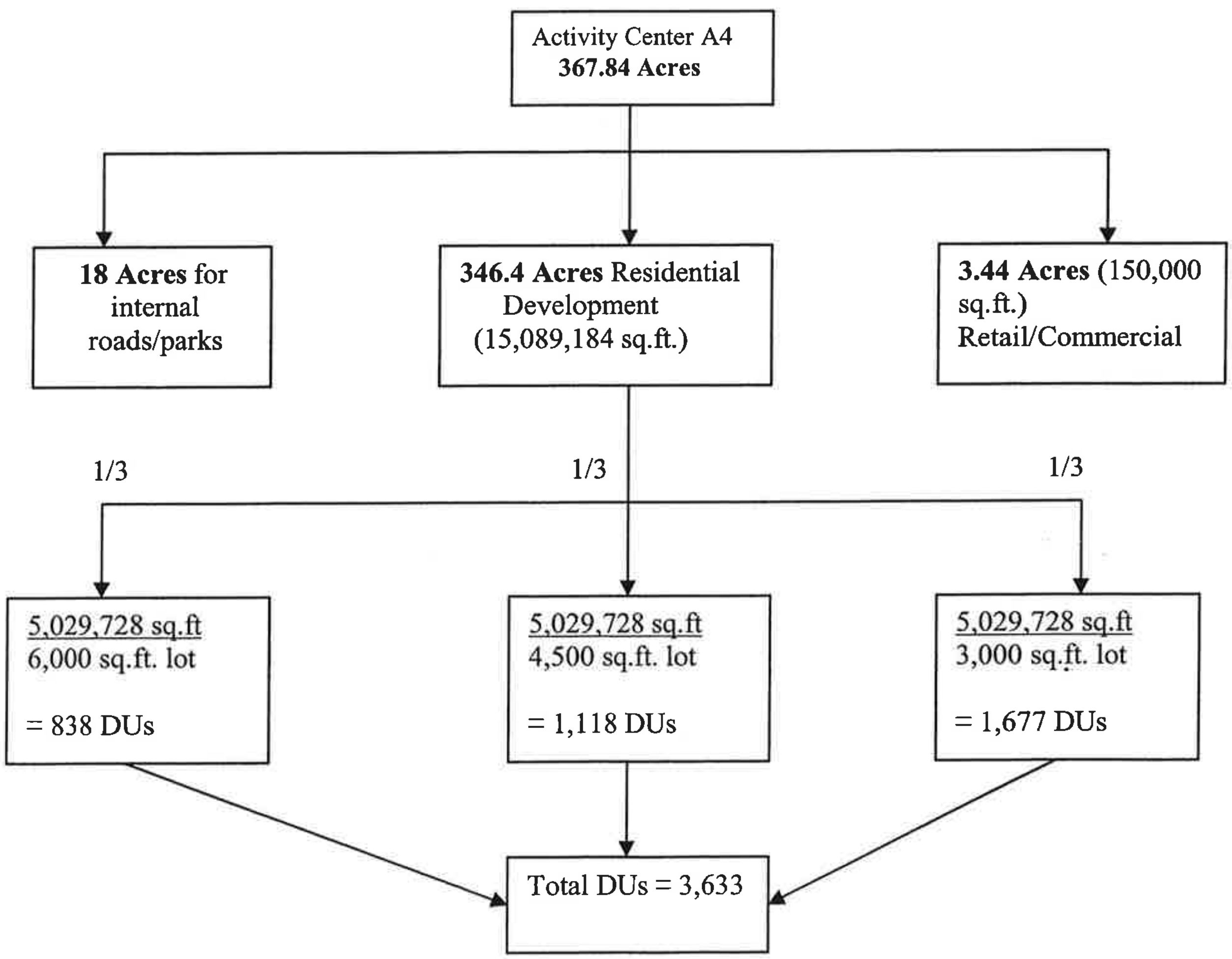
Step 1:

Geographic Location: adjacent to Gill Neck Road (Near Lewes)

Target Dwelling Units: 3,525

Activity Center Area: 367.84 acres

Step 2:



Step 3:

Extra DUs than Target = 3,633 – 3,525 = 108

Option 1

Keep surplus units as it is, as a positive reserve to balance the needs in other activity centers

Option 2

Reduce 108 units and add the acreage to the internal roadways and reserved green space

Moderate

Reduce

36 – 6,000 sq.ft. Units
36 – 4,500 sq.ft. Units
36 – 3,000 sq.ft. Units
Total acreage gained for internal roads and parks
= 486,000 sq.ft.
= 11.16 acres

Minimum

Reduce

108 – 3,000 sq.ft. Units

Total acreage gained for internal roads and parks
= 324,000 sq.ft.
= 7.43 acres

Maximum

Reduce

108 – 6,000 sq.ft. Units

Total acreage gained for internal roads and parks
= 648,000 sq.ft.
= 14.86 acres

Step 4:

Activity Center (A1) development mix used for calculating trip generation:

- 3,5250 DUs
  → 802 Single Family detached units
  → 1,082 Condominium units
  → 1,641 Apartment units

- 3.44 acres (150,000 sq.ft.) of Retail/Commercial Development

- 29.16 acres of open space for internal roads/ parks etc.

E. Activity Center (A5):

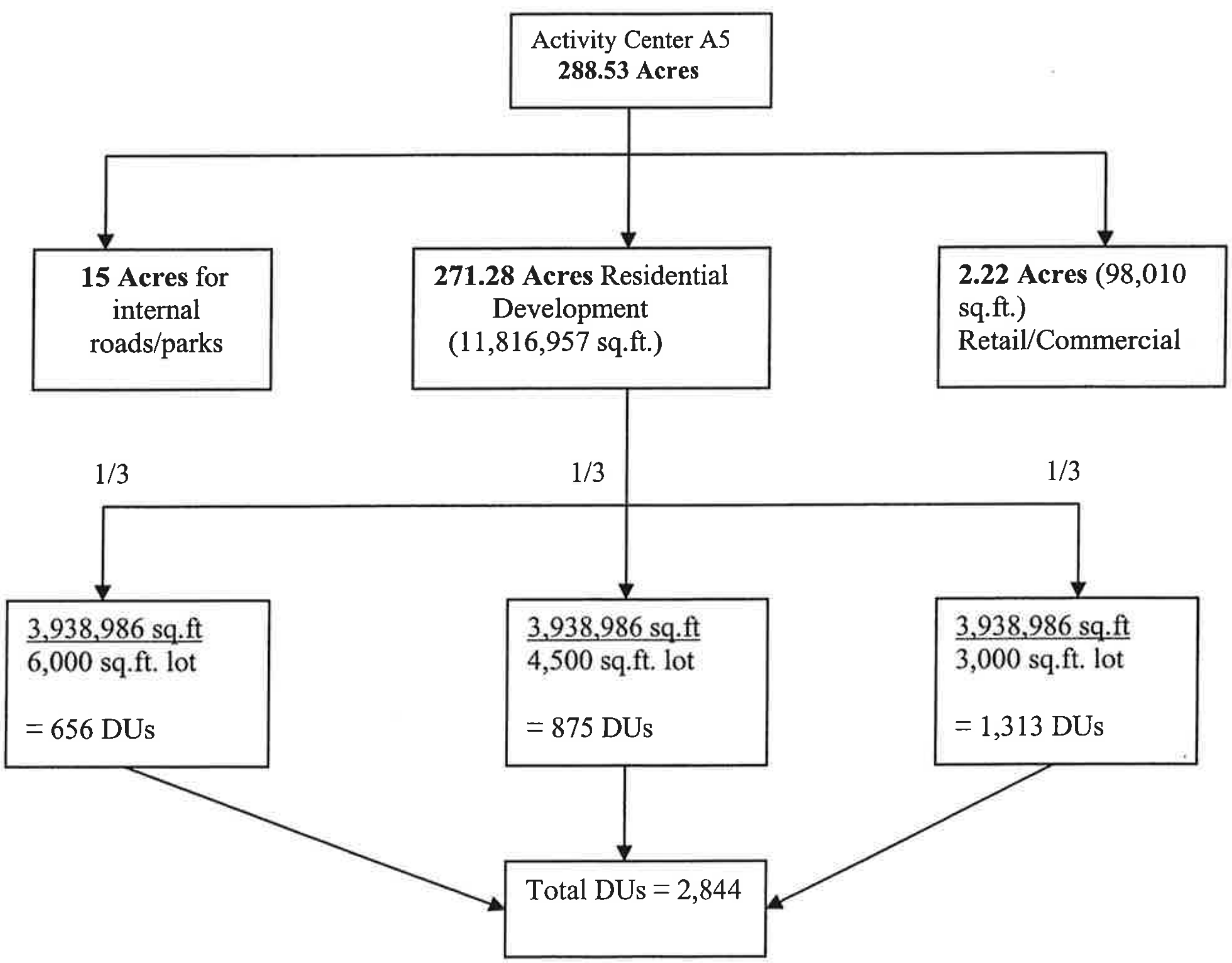
Step 1:

Geographic Location: at the intersection of RD283 and RD275

Target Dwelling Units: 2,775

Activity Center Area: 288.53 acres

Step 2:



Step 3:

Extra DUs than Target = 2,844 – 2,775 = 69

Option 1

Keep surplus units as it is, as a positive reserve to balance the needs in other activity centers

Option 2

Reduce 69 units and add the acreage to the internal roadways and reserved green space

Moderate

Reduce

23 – 6,000 sq.ft. Units
23 – 4,500 sq.ft. Units
23 – 3,000 sq.ft. Units
Total acreage gained for internal roads and parks
= 310,500 sq.ft.
= 7.13 acres

Minimum

Reduce

69 – 3,000 sq.ft. Units

Total acreage gained for internal roads and parks
= 207,000 sq.ft.
= 4.75 acres

Maximum

Reduce

69 – 6,000 sq.ft. Units

Total acreage gained for internal roads and parks
= 414,000 sq.ft.
= 9.5 acres

Step 4:

Activity Center (A1) development mix used for calculating trip generation:

- 2,844 DUs
  → 656 Single Family detached units
  → 875 Condominium units
  → 1313 Apartment units

- 2.25 acres (98,010 sq.ft.) of Retail/Commercial Development

- 15 acres of open space for internal roads/ parks etc.

Summary of development mix for the five activity centers:

Activity Center	Dwelling Units	Retail/Commercial Space (acres)	Open Space Reserved for Internal Roads/ Green Space (acres)
A1	3,700	2.20	32.25
A2	1,621	0.75	17.00
A3	1,280	0.75	13.60
A4	3,525	3.44	29.13
A5	2,844	2.25	15.00
Total	**12,970**	**9.39**	**106.85**

- Proposed residential units (12,970) are almost equal to the target dwelling units in the activity centers (12,969)
- Open space reserved for internal roads and green space (106.85 acres) in the activity centers/villages is almost 8% of the total land proposed for the five activity centers (1,351.30 acres).

State Route 1 Land Use/Transportation Study

Technical Memorandum

F. Activity Center Trip Generation

Prepared For:
Delaware Department of Transportation

Prepared By:
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I. Introduction:

The purpose of this technical memorandum is to explain the methodology used for calculating Saturday peak hour trip generation, display total trip generation for the Saturday peak hour by TAZs for the Activity Center Scenario and discuss special considerations, which should be considered while undertaking the trip distribution exercise due to unique nature of this scenario.

II. Brief Discussion about the Activity Center Scenario:

This scenario is based on the basic principle of managing the development potential of the study area in a compact mixed-use manner. The compact mixed-use nature of the activity centers would partially eliminate the need for the local residents to access the SR1 Corridor for their day-to-day retail/commercial requirements, promote use of alternative modes of travel like walking, bicycling, and encourage any future transit possibilities due to favorable development densities. The overall development potential (i.e. total number of potential dwelling units) have been kept same as that of the Expanded Development District Scenario. The total number of potential new dwelling units in the study area for the Activity Center Scenario will be 18,103 (same as that for the Expanded Development District Scenario).

In order to achieve the compactness of the mixed-use development, 5 Activity Centers have been located within the study area and development potential of the land outside the Activity Centers has been reduced to 1 DU/acre. The size of each activity center has been decided based on its location, available vacant land at/near the location and to achieve reasonable development density within the activity center.

III. Trip Generation Calculations:

The total trip generation for the Activity Center Scenario is sum of the following three components:

a) Trip generation for the Base Land Use Scenario.
b) Trip Generation for the activity centers.
c) Trip Generation for the vacant land/farmland outside the activity centers.

a) Trip generation for the Base Land Use Scenario:

Table 1 shows the total number of entering and exiting trips by TAZs for the Base Land Use Scenario.

Table 1 - Total Entering and Exiting Trips by TAZs For the Base Land Use Scenario

New Split TAZ	Entering Trips	Exiting Trips
18601120/1	0	0
18601120/2	0	0
18801180/1	0	0
18801180/2	55	47

19001120	0	0
19401080/1	0	0
19401080/2	0	0
19401140/1	241	206
19401140/2	0	0
19401180/1	0	0
19401180/2	298	253
19601120	0	0
19801160/1	842	809
19801160/2	9	9
19801160/3	10	9
19801180/1	40	39
19801180/2	0	0
19801180/3	14	23
19801200	0	0
20201040/1	0	0
20201040/2	0	0
20201040/3	355	125
20201040/4	0	0
20201120	105	80
20401140/1	882	845
20401140/2	111	94
20401160/1	0	0
20401160/2	57	49
20401160/3	0	0
20401220	0	0
20401240	0	0
20601120/1	0	0
20601120/2	0	0
20601120/3	0	0
20601120/4	30	26
20601140	62	59
20801040/1	976	937
20801040/2	0	0
20801040/3	25	22
20801040/4	73	63
20801040/5	0	0
20801040/6	104	88
20801040/7	0	0
20801040/8	0	0
20801040/9	0	0
20801040/10	22	35
20801120/1	286	283
20801120/2	0	0

20801120/3	0	0
20801120/4	259	246
20801140/1	16	14
21001141	0	0
21001142	0	0
21401100/1	0	0
21401100/2	40	27
21601060	0	0
21801080	0	0
21801100	0	0
Total	**4912**	**4388**

b) Trip Generation for the Activity Centers:

The size of each activity center and the mix of developments within each activity center have been estimated based on an iterative process. The process is explained in a separate technical memorandum.

This technical memorandum focuses on the trips generated by each of the activity centers, assumptions made about the percentage of the internal trips that will occur due to mixed-use nature and discussion about special trip distribution consideration for each of the activity centers.

Basic assumptions made while conducting the trip generation for the activity centers are as follows:

- Since relative placement of mixed development within an activity center has not been considered during the initial stage of concept planning, the trip generation is based on the overall development within each activity center rather than working with individual land parcels within the activity center.

- If an activity center is shared by two or more TAZs, then the distribution of generated trips among these TAZs is based upon the ratio of the area of the activity center in each TAZ.

  For example, if an activity center with 10-acre area generates 100 trips and 2-acre portion of the activity center is located in TAZ '1' while the remaining 8-acre of the activity center land lies in TAZ '2', then 20 out of 100 trips will be assigned to TAZ '1' while 80 trips will be assigned to TAZ '2' based on the land area proportion.

- It has been assumed that 75% of the trips generated by retail/commercial developments within an activity center will be originated from the residential developments within the same activity center (internal trips). If the activity center is located within one single TAZ, then these trips should not be considered while carrying out inter-zonal trip distribution. If the activity center is shared between two or more TAZs then the internal trips should distributed only among the TAZs on which the activity center is located.

- An internal trip made for retail/commercial shopping has 2 trip ends (origin: residential unit & destination: retail/commercial center or vice versa on the way back). Thus, this internal trip is counted twice, once in the trip production for residential units and once for trip attraction by the retail/commercial center. This while doing the inter-zonal trip distribution, internal trips related to the retail/commercial centers should be deducted twice.

  For example, consider retail/commercial shops within an activity center generate 1000 trips and residential units within that activity center generate 3000 trips. Then based on 75% internal trips assumption for the retail/commercial uses, 750 out of 1000 trips for retail/commercial shops are internal. It also means that 750 trips out of 3000 trips generated by the residential units are internal trips intended for neighborhood shopping. Thus, while doing inter-zonal trip distribution, only 250 retail/commercial related trips and 2,250 residential related trips should be distributed to other TAZs. Thus, in this case, 1,500 trips will be internal trips and 2,500 trips are inter-zonal trips.

- Since the nature of the retail/commercial developments within each activity center will vary, ITE category 815: free standing discount shops has been used for the trip generation purpose in order to be consistent with the previous assumptions made regarding vacant commercial land along SR1 corridor in all the previous scenarios.

- Since each activity center is proposed to have three types of housing units, while calculating the trip generation for activity centers three different trip rates have been used depending upon the type of residential development.

1. Activity Center 1 (A1):

Geographic Location: located between SR24 and RD274 adjacent to school.

Area: 386.20 Acres

Shared between: 3 TAZs (20201040/1: 94%, 20201120: 6%, 20201040/4: Negligible)

Intended Development & Trip Generation:

Intended Development	Trip Generation	Entering Trips	Exiting Trips
3,700 DUs:			
841 SF Detached	791	427	364
1,135 Condos	533	288	245
1,724 Apartments	896	448	448
95,832 sq.ft. GFA of retail/commercial establishments	734	374	360
Total	2,954	1,537	1,417

Internal Trips:

75% of 734 retail/commercial trips = 551
Equal portion of internal trip ends from residential units (as discussed in assumptions) = 551

Total internal trips: 1,102

Trip Generation by TAZs (Excluding the internal trips)

New Split TAZ	Entering Trips	Exiting Trips
20201040/1	905	835
20201120	58	53
20201040/4	-	-
Total Trips Excluding Internal Trips	963	888

2. Activity Center 2 (A2):

Geographic Location: located between SR24 and RD274 adjacent to the Medical Center.

Area: 172.25 Acres

Located within: 1 TAZs (20601140)

Intended Development & Trip Generation:

Intended Development	Trip Generation	Entering Trips	Exiting Trips
1,621 DUs:			
374 SF Detached	352	190	162
499 Condos	235	127	108
748 Apartments	389	195	194
32,670 sq.ft. GFA of retail/commercial establishments	250	128	122
Total	1,226	640	586

Internal Trips:

75% of 250 retail/commercial trips = 188
Equal portion of internal trip ends from residential units (as discussed in assumptions) = 188

Total internal trips: 376

Trip Generation by TAZs (Excluding the internal trips)

New Split TAZ	Entering Trips	Exiting Trips
20601140	442	408
Total Trips Excluding Internal Trips	442	408

3. Activity Center 3 (A3):

Geographic Location: located between SR23 and US9.

Area: 136.48 Acres

Shared between: 2 TAZs (18601120/2: 47%, 19401140/2: 53%)

Intended Development & Trip Generation:

Intended Development	Trip Generation	Entering Trips	Exiting Trips
1,280 DUs:			
295 SF Detached	277	150	127
394 Condos	185	100	85
591 Apartments	307	154	153
32,670 sq.ft. GFA of retail/commercial establishments	250	128	122
Total	1,019	532	487

Internal Trips:

75% of 250 retail/commercial trips = 188
Equal portion of internal trip ends from residential units (as discussed in assumptions) = 188

Total internal trips: 376

Trip Generation by TAZs (Excluding the internal trips)

New Split TAZ	Entering Trips	Exiting Trips
18601120/2	157	145
19401140/2	177	164
Total Trips Excluding Internal Trips	334	309

4. Activity Center 4 (A4):

Geographic Location: located along RD268 adjacent to Gill Neck Road.

Area: 367.84 Acres

Shared between: 3 TAZs (20401160/3: 52%, 20401220: 26%, 20401240: 22%)

Intended Development & Trip Generation:

Intended Development	Trip Generation	Entering Trips	Exiting Trips
3,525 DUs:			
802 SF Detached	754	407	347
1,082 Condos	509	275	234
1,641 Apartments	853	427	426
150,000 sq.ft. GFA of retail/commercial establishments	1,149	586	563
Total	3,265	1,695	1,570

Internal Trips:

**NOTE: Since this activity center is in the immediate vicinity of Lewes, and has substantial retail/commercial space, it has been estimated that it will attract retail/commercial customers from Lewes. Thus, instead of using 75% internal trips related to retail/commercial use for this particular activity center, the percentage of internal trips has been reduced to 50%.

50% of 1,149 retail/commercial trips = 575
Equal portion of internal trip ends from residential units (as discussed in assumptions) = 575

Total internal trips: 1,150

Trip Generation by TAZs (Excluding the internal trips)

New Split TAZ	Entering Trips	Exiting Trips
20401160/3	572	528
20401220	286	264
20401240	242	223
Total Trips Excluding Internal Trips	1,100	1,015

5. Activity Center 5 (A5):

Geographic Location: located at the intersection of RD283 and RD275.

Area: 288.53 Acres

Shared between: 2 TAZs (19601120: 55%, 20201120: 45%)

Intended Development & Trip Generation:

Intended Development	Trip Generation	Entering Trips	Exiting Trips
2,844 DUs:			
656 SF Detached	617	333	284
875 Condos	411	222	189
1,313 Apartments	683	342	341
98,010 sq.ft. GFA of retail/commercial establishments	751	383	368
Total	2,462	1,280	1,182

Internal Trips:

75% of 751 retail/commercial trips = 563
Equal portion of internal trip ends from residential units (as discussed in assumptions) = 563

Total internal trips: 1,126

Trip Generation by TAZs (Excluding the internal trips)

New Split TAZ	Entering Trips	Exiting Trips
19601120	382	353
20201120	313	292
Total Trips Excluding Internal Trips	695	641

Table 2 summarizes the inter-zonal trips associated with all the activity centers (w/o internal trips) by TAZs.

Table 3 shows the total internal trips for all the activity centers. As discussed earlier in the assumptions, if the activity center is located within one single TAZ, then internal trips should not be considered while carrying out inter-zonal trip distribution. If the activity center is shared between two or more TAZs then the internal trips should distributed only among the TAZs on which the activity center is located.

Table 2 – Total Entering and Exiting Trips by TAZs for the Activity Centers (Excluding Internal Trips)

New Split TAZ	Entering Trips	Exiting Trips
18201180	0	0
18601120/1	0	0
18601120/2	157	145
18801180/1	0	0
18801180/2	0	0
18801200	0	0
19001120	0	0
19401080/1	0	0
19401080/2	0	0
19401140/1	0	0
19401140/2	177	164
19401180/1	0	0
19401180/2	0	0
19601120	382	353
19801160/1	0	0
19801160/2	0	0
19801160/3	0	0
19801180/1	0	0
19801180/2	0	0
19801180/3	0	0
19801200	0	0
20201040/1	905	835
20201040/2	0	0
20201040/3	0	0
20201040/4	0	0
20201120	371	345
20401140/1	0	0
20401140/2	0	0
20401160/1	0	0
20401160/2	0	0
20401160/3	572	528
20401220	286	264
20401240	242	223
20601120/1	0	0
20601120/2	0	0
20601120/3	0	0
20601120/4	0	0

20601140	443	408
20801040/1	0	0
20801040/2	0	0
20801040/3	0	0
20801040/4	0	0
20801040/5	0	0
20801040/6	0	0
20801040/7	0	0
20801040/8	0	0
20801040/9	0	0
20801040/10	0	0
20801120/1	0	0
20801120/2	0	0
20801120/3	0	0
20801120/4	0	0
20801140/1	0	0
21001141	0	0
21001142	0	0
21401100/1	0	0
21401100/2	0	0
21601060	0	0
21801080	0	0
21801100	0	0
Total	**3,534**	**3,261**

Table 3
Total Entering and Exiting Internal Trips Associated with the Activity Centers

Activity Center	Total Internal Trips	Entering Trips	Existing Trips
A1	1,102	579	523
A2	376	197	179
A3	376	197	197
A4	1,150	604	546
A5	1,126	591	535
Total	4,130	2,168	1,962

c) Trip Generation for the Vacant Land/Farmland outside the Activity Centers:

Table 4 shows the details of the vacant land/farmland parcels outside the activity centers and trip generation (with entering trips and exiting trips split) for these parcels. The following assumptions have been made while calculating the trip generation for the vacant land parcels/farmlands:

- All the vacant residential land/farmland outside the activity centers will be developed at 1 DU/acre density.

- Due to the mixed-use nature of the activity centers, the retail and commercial establishments within these activity centers will mainly attract local residents in the neighborhood. This will indirectly result in reduction in the attraction potential of the vacant commercial parcels along the SR1 Corridor based on the nature of developments that will occupy these vacant parcels. This is mainly because, if the commercial establishments, which will occupy the vacant C-1 zoned parcels along SR1, are of the similar nature as that of ones in the activity centers, then local residents would prefer to shop in the neighborhood instead of accessing the SR1 commercial establishments. In order to compensate for the impact of the activity center commercial/retail developments, the trip rates for the vacant commercial parcels along SR1 have been reduced. The reduction in the trip rates is in such a way that it will balance the internal trips attracted by the activity center retail/commercial establishments.

Table 5 summarizes the entering and exiting trips associated with the vacant land/farmland outside the activity centers by TAZs.

Table 4: Trip Generation for Vacant Parcels and Farmlands Outside the Activity Centers

Map #	Map Parcel #	Status Code	Zoning	Within Activity Center	TAZ #	Area (acres)	Units	Trip Gen.	Entering Trips	Exiting Trips
				Codes: 4=Yes, 1=No						
3-34-1	9	Vacant	AR-1	1	18801200	391.17	391	368	199	169
3-34-1	15.02	Vacant	AR-1	1	18801200	3.74	4	4	2	2
3-34-1	15.03	Vacant	AR-1	1	18801200	3.74	4	4	2	2
3-34-1	16	Vacant	AR-1	1	18801200	1.23	1	1	1	1
3-34-1	16.01	Vacant	AR-1	1	18801200	0.24	1	1	1	0
3-34-1	16.05	Vacant	AR-1	1	18801200	1.27	1	1	1	1
3-34-1	16.07	Vacant	AR-1	1	18801200	1.23	1	1	1	1
3-34-1	16.08	Vacant	AR-1	1	18801200	1.23	1	1	1	1
3-34-1	16.09	Vacant	AR-1	1	18801200	1.23	1	1	1	1
3-34-1	16.1	Vacant	AR-1	1	18801200	1.23	1	1	1	1
3-34-1	27.01	Vacant	AR-1	1	18801200	4.94	5	5	3	2
3-34-1	4	Vacant	C-1		18801200	2.43		152	77	74
3-34-1	6.07	Vacant	C-1		18801200	1.07		67	34	33
3-34-1	6.01	Vacant	C-1		18801200	1.00		63	32	31
3-34-1	6.06	Vacant	C-1		18801200	1.35		84	43	41
3-34-1	6	Vacant	C-1		18801200	1.34		84	43	41
3-34-11	3.01	Farmland	AR-1	1	19001120	46.41	46	44	24	20
3-34-11	5	Farmland	AR-1	1	19001120	248.75	249	234	126	108
3-34-11	7	Farmland	AR-1	1	19001120	21.13	21	20	11	9
3-34-11	7.03	Farmland	AR-1	1	19001120	21	21	20	11	9
3-34-11	7.04	Farmland	AR-1	1	19001120	32.07	32	30	16	14
3-34-11	7.05	Farmland	AR-1	1	19001120	10.94	11	10	6	5
3-34-11	8	Farmland	AR-1	1	19001120	44.1	44	41	22	19
3-34-11	21	Farmland	AR-1	1	19001120	17.15	17	16	9	7
3-34-11	22	Farmland	AR-1	1	19001120	17.2	17	16	9	7
3-34-11	Adjoining 22	Farmland	AR-1	1	19001120	28.2	28	27	14	12
3-34-11	12	Vacant	GR	1	19001120	0.53	1	0	0	0
3-34-11	13	Vacant	GR	1	19001120	0.81	1	1	0	0
3-34-11	20	Farmland	GR	1	19001120	6.13	6	6	3	3
3-34-11	25	Farmland	GR	1	19001120	10.72	11	10	5	5

3-34-11	46/1	Farmland	AR-1		1	19601120	12.6	13	12	6	5
3-34-11	46/2	Farmland	AR-1		1	19601120	40	40	38	20	17
3-34-11	Adjoining 47	Vacant	AR-1		1	19601120	0.6	1	1	1	0
3-34-11	Adjoining 47	Vacant	AR-1		1	19601120	0.6	1	1	1	0
3-34-11	Adjoining 47	Vacant	AR-1		1	19601120	0.6	1	1	1	0
3-34-11	Adjoining 47	Vacant	AR-1		1	19601120	0.4	1	1	1	0
3-34-11	49	Vacant	AR-1		1	19601120	2.53	5	5	3	2
3-34-11	81	Farmland	AR-1		1	19601120	48.33	48	45	25	21
3-34-11	81.01	Vacant	AR-1		1	19601120	0.75	1	1	1	0
3-34-11	81.02	Vacant	AR-1		1	19601120	0.75	1	1	1	0
3-34-11	81.03	Vacant	AR-1		1	19601120	0.75	1	1	1	0
3-34-11	81.04	Vacant	AR-1		1	19601120	0.75	1	1	1	0
3-34-11	83	Farmland	AR-1		1	19401080/2	97.4	97	92	49	42
3-34-11	86	Farmland	AR-1		1	19401080/2	39.2	39	37	20	17
3-34-11	98.01	Vacant	GR		1	19401080/2	0.14	1	1	1	0
3-34-11	98.02	Vacant	GR		1	19401080/2	0.14	1	1	1	0
3-34-11	29	Farmland	AR-1		1	19401140/2	32.44	32	30	16	14
3-34-11	42	Vacant	AR-1		1	19401140/2	9.4	19	18	10	8
3-34-11	43	Farmland	AR-1		1	19401140/2	53.45	53	50	27	23
3-34-11	43.01	Farmland	AR-1		1	19401140/2	35	35	33	18	15
3-34-11	45	Farmland	AR-1		1	19401140/2	61.7	62	58	31	27
3-34-11	28	Vacant	GR		1	19401140/2	0.14	1	1	1	0
3-34-11	30	Vacant	GR		1	19401140/2	3	3	3	2	1
3-34-11	31	Vacant	GR		1	19401140/2	0.12	1	1	1	0
3-34-11	41	Vacant	GR		1	19401140/2	0.69	1	1	1	0
3-34-12	6.01/2	Farmland	AR-1		1	19601120	15.88	16	15	8	7
3-34-12	8	Vacant	AR-1		1	19601120	4	8	8	4	3
3-34-12	9	Vacant	AR-1		1	19601120	1	2	2	1	1
3-34-12	10.01	Vacant	AR-1		1	19601120	2.4	5	5	3	2
3-34-12	11	Vacant	AR-1		1	19601120	1.04	2	2	1	1
3-34-12	13/1	Farmland	AR-1		1	19601120	93.66	94	88	48	40
3-34-12	13.01	Farmland	AR-1		1	19601120	66.84	67	63	34	29
3-34-12	46	Farmland	AR-1		1	20201120	37.11	37	35	19	16

3-34-12	48.02	Vacant	AR-1	1	20201120	0.53	1	0	0	0
3-34-12	48.03	Vacant	AR-1	1	20201120	0.03	1	1	1	0
3-34-12	50	Vacant	AR-1	1	20201120	1	1	1	1	0
3-34-12	57.01	Farmland	AR-1	1	20201120	8.76	9	8	4	4
3-34-12	57.04	Farmland	AR-1	1	20201120	32.79	33	31	17	14
3-34-12	123.02/1	Vacant	B-1		20601140	1	4	2	1	1
3-34-12	16/2	Farmland	AR-1	1	19401080/2	239.84	240	225	122	104
3-34-12	17	Farmland	AR-1	1	19401080/2	67.4	67	63	34	29
3-34-12	17.01	Vacant	AR-1	1	19401080/2	0.5	1	1	1	0
3-34-12	19	Farmland	AR-1	1	19401080/2	51	51	48	26	22
3-34-12	22	Farmland	AR-1	1	19401080/2	6	6	6	3	3
3-34-12	44	Vacant	AR-1	1	19401080/2	0.28	1	1	1	0
3-34-12	45.01	Vacant	AR-1	1	19401080/2	0.63	1	1	1	0
3-34-12	15.07	Vacant	GR	1	19401080/2	0.43	1	1	1	0
3-34-12	16/1	Farmland	GR	1	19401080/2	84.35	84	79	43	36
3-34-12	116	Farmland	AR-1	1	20201040/1	43	43	40	22	19
3-34-12	122.03	Farmland	AR-1	1	20201040/2	34.65	35	33	18	15
3-34-13	335	Farmland	AR-1	1	20601120/4	8.47	8	8	4	4
3-34-13	334	Farmland	MR	1	20601120/4	51.67	52	49	26	22
3-34-13	334.01	Farmland	MR	1	20601120/4	60.23	60	57	31	26
3-34-13	334.02	Farmland	MR	1	20601120/4	27.25	27	26	14	12
3-34-13	334.03	Farmland	MR	1	20601120/4	15	15	14	8	6
3-34-13	334.04	Farmland	MR	1	20601120/4	15	15	14	8	6
3-34-13	325.18	Vacant	C-1		20801040/10	11.66		729	372	357
3-34-13	164.01	Vacant	AR-1	1	20801040/2	0.68	1	1	1	0
3-34-13	171.01	Vacant	AR-1	1	20801040/2	1.51	2	1	1	1
3-34-13	171.02	Vacant	AR-1	1	20801040/2	1.25	1	1	1	0
3-34-13	185.01	Vacant	AR-1	1	20801040/2	0.5	1	1	1	0
3-34-13	325.07	Vacant	MR	1	20801040/6	1.98	8	8	4	4
3-34-13	319	Vacant	C-1		20801040/9	0.46		29	15	14
3-34-13	325.01	Vacant	C-1		20801040/9	4.83		302	154	148
3-34-13	325.24	Vacant	C-1		20801040/9	4.25		266	136	130
3-34-13	3	Vacant	C-1		20801120/1	0.5		31	16	15

3-34-13	8.04	Vacant	C-1		20801120/1	0.62		39	20	19
3-34-13	325	Farmland	AR-1	1	20801120/3	41.4	41	39	21	18
3-34-13	341	Vacant	AR-1	1	20801120/3	1	1	1	1	0
3-34-13	342	Vacant	AR-1	1	20801120/3	5.45	5	5	3	2
3-34-13	343	Vacant	AR-1	1	20801120/3	6.16	6	6	3	3
3-34-13	325.41	Vacant	C-1		20801120/4	0.6		38	19	18
3-34-13	106.01	Vacant	GR	1	20801140/1	0.41	1	1	1	0
3-34-13	325.28	Vacant	AR-1	1	21401100/2	3.19	3	3	2	1
3-34-13	325.08	Vacant	C-1		21401100/2	2.37		148	76	73
3-34-13	325.14	Vacant	C-1		21401100/2	2.35		147	75	72
3-34-13	325.15	Vacant	C-1		21401100/2	2.4		150	77	74
3-34-13	356	Vacant	C-1		21401100/2	0.6		38	19	18
3-34-13	360	Vacant	C-1		21401100/2	3.7		231	118	113
3-34-18	2	Farmland	AR-1	1	19401080/1	72.42	72	68	37	31
3-34-18	13	Farmland	AR-1	1	19401080/1	22.03	22	21	11	10
3-34-18	8	Vacant	MR	1	19401080/1	0.45	2	2	1	1
3-34-18	14	Vacant	MR	1	19401080/1	0.3	1	1	1	0
3-34-18	15	Vacant	MR	1	19401080/1	0.37	1	1	1	0
3-34-18	16	Vacant	MR	1	19401080/1	0.32	1	1	1	0
3-34-18	17	Vacant	MR	1	19401080/1	0.3	1	1	1	0
3-34-18	42/2	Farmland	AR-1	1	20201040/1	196.32	196	185	100	85
3-34-18	42.02	Vacant	AR-1	1	20201040/1	1.68	2	2	1	1
3-34-18	43 Part 2	Farmland	AR-1	1	20201040/1	120	120	113	61	52
3-34-18	31	Vacant	AR-1	1	20201040/3	3.84	4	4	2	2
3-34-18	38.05	Vacant	AR-1	1	20201040/3	2.16	2	2	1	1
3-34-18	40.01	Farmland	AR-1	1	20201040/3	36.3	36	34	18	16
3-34-18	564	Vacant	AR-1	1	20201040/3	1.05	1	1	1	0
3-34-18	565	Vacant	AR-1	1	20201040/3	1.08	1	1	1	0
3-34-18	566	Vacant	AR-1	1	20201040/3	2.41	2	2	1	1
3-34-18	567	Vacant	AR-1	1	20201040/3	1.31	1	1	1	0
3-34-18	568	Vacant	AR-1	1	20201040/3	1.48	1	1	1	0
3-34-18	569	Vacant	AR-1	1	20201040/3	1.48	1	1	1	0
3-34-18	570	Vacant	AR-1	1	20201040/3	1.78	2	2	1	1

3-34-18	571	Vacant	AR-1	1	20201040/3	2.16	2	2	1	1
3-34-18	572	Vacant	AR-1	1	20201040/3	2.19	2	2	1	1
3-34-18	573	Vacant	AR-1	1	20201040/3	1.79	2	2	1	1
3-34-18	574	Vacant	AR-1	1	20201040/3	1.54	2	1	1	0
3-34-18	575	Vacant	AR-1	1	20201040/3	1.91	2	2	1	1
3-34-18	576	Vacant	AR-1	1	20201040/3	1.46	1	1	1	0
3-34-18	577	Vacant	AR-1	1	20201040/3	1.7	2	2	1	1
3-34-18	578	Vacant	AR-1	1	20201040/3	1.73	2	2	1	1
3-34-18	579	Vacant	AR-1	1	20201040/3	1.53	2	1	1	0
3-34-18	581	Vacant	AR-1	1	20201040/3	1.07	1	1	1	0
3-34-18	582	Vacant	AR-1	1	20201040/3	1.06	1	1	1	0
3-34-18	47	Vacant	AR-1	1	20201040/4	1	1	1	1	0
3-34-18	48	Vacant	AR-1	1	20201040/4	0.17	1	1	1	0
3-34-18	78	Vacant	AR-1	1	20201040/4	3.8	4	4	2	2
3-34-18	200	Vacant	AR-1	1	20201040/4	3.18	3	3	2	1
3-34-18	416	Farmland	AR-1	1	20801040/4	36.6	37	34	19	16
3-34-18	417	Farmland	AR-1	1	20801040/4	32.8	33	31	17	14
3-34-18	418	Farmland	AR-1	1	20801040/4	45.9	46	43	23	20
3-34-19	10	Vacant	AR-1	1	20801040/3	0.19	1	1	1	0
3-34-19	13.03	Vacant	AR-1	1	20801040/3	0.22	1	1	1	0
3-34-19	13.04	Vacant	AR-1	1	20801040/3	0.22	1	1	1	0
3-34-19	18	Vacant	AR-1	1	20801040/3	0.1	1	1	1	0
3-34-19	20.01	Vacant	AR-1	1	20801040/3	0.2	1	1	1	0
3-34-19	21.01	Vacant	AR-1	1	20801040/3	0.1	1	1	1	0
3-34-19	21.04	Vacant	AR-1	1	20801040/3	0.32	1	1	1	0
3-34-19	21.07	Vacant	AR-1	1	20801040/3	0.08	1	1	1	0
3-34-19	21.08	Vacant	AR-1	1	20801040/3	1.67	2	2	1	1
3-34-19	21.1	Vacant	AR-1	1	20801040/3	0.44	1	1	1	0
3-34-19	21.6	Vacant	AR-1	1	20801040/3	0.39	1	1	1	0
3-34-19	1.03	Farmland	AR-1	1	20801040/4	82.6	83	78	42	36
3-34-19	1.05	Farmland	AR-1	1	20801040/4	59.2	59	56	30	26
3-34-19	154.01	Pending	MR	1	20801040/6	19	19	18	10	8
3-34-19	380.01	Vacant	MR	1	20801040/6	25.58	26	24	13	11

3-34-19	380.02	Vacant	MR	1	20801040/6	2.4	2	2	1	1
3-34-19	380.03	Vacant	MR	1	20801040/6	2.28	2	2	1	1
3-34-19	380.04	Vacant	MR	1	20801040/6	2.28	2	2	1	1
3-34-5	168	Vacant	AR-1	1	18201180	11.96	12	11	6	5
3-34-5	72.03	Vacant	AR-1	1	18801200	8.03	8	8	4	3
3-34-5	72.02	Farmland	AR-1	1	18801200	15.32	15	14	8	7
3-34-5	174	Farmland	AR-1	1	18601120/2	102.23	102	96	52	44
3-34-5	175/1	Farmland	AR-1	1	18601120/2	383.72	384	361	195	166
3-34-5	176	Vacant	AR-1		18601120/2	3.32	7	7	4	3
3-34-5	180	Vacant	AR-1	1	18601120/2	0.43	1	1	1	0
3-34-5	141	Vacant	C-1		18801180/1	2.44		153	78	75
3-34-5	143	Vacant	C-1		18801180/1	1.9		119	61	58
3-34-5	144.01	Vacant	C-1		18801180/1	0.43		27	14	13
3-34-5	147	Vacant	C-1		18801180/1	0.83		52	26	25
3-34-5	152.02	Vacant	C-1		18801180/1	1.32		83	42	40
3-34-5	152.03	Vacant	C-1		18801180/1	0.46		29	15	14
3-34-5	70	Farmland	AR-1	1	18801180/2	109.66	110	103	56	47
3-34-5	153	Farmland	AR-1	1	18801180/2	61.39	61	58	31	27
3-34-5	225.02	Vacant	AR-1	1	19401140/1	5.05	5	5	3	2
3-34-5	78	Vacant	C-1		19401180/2	0.42		26	13	13
3-34-5	80.02	Vacant	C-1		19401180/2	0.29		18	9	9
3-34-5	88	Vacant	C-1		19401180/2	0.76		48	24	23
3-34-5	90	Vacant	C-1		19401180/2	2.33		146	74	71
3-34-6	550	Vacant	AR-1	1	19601120	0.76	1	1	0	0
3-34-6	551.01	Vacant/Farm	AR-1	1	19601120	15	15	14	8	6
3-34-6	552	Farmland	AR-1	1	19601120	11.2	11	11	6	5
3-34-6	1257	Vacant	AR-1	1	19601120	0.48	1	1	1	0
3-34-6	1299	Vacant	AR-1	1	19401140/1	0.66	1	1	0	0
3-34-6	687	Vacant	C-1		19801160/1	6.49		406	207	199
3-34-6	500	Vacant	AR-1	1	19801160/2	2.9	3	3	1	1
3-34-6	502	Vacant	AR-1	1	19801160/2	0.7	1	1	1	0
3-34-6	503	Farmland	AR-1	1	19801160/2	26.36	26	25	13	11
3-34-6	504.02	Vacant	AR-1	1	19801160/2	10.5	11	10	5	5

3-34-6	504.05	Vacant	AR-1	1	19801160/2	1.88	2	2	1	1
3-34-6	504.06	Vacant	AR-1	1	19801160/2	1	1	1	1	0
3-34-6	511	Vacant	AR-1	1	19801160/2	4.92	5	5	2	2
3-34-6	511.04	Vacant	AR-1	1	19801160/2	0.16	1	1	1	0
3-34-6	523	Vacant/Farm	AR-1	1	19801160/2	14.62	15	14	7	6
3-34-6	526/2	Vacant	AR-1	1	19801160/2	20.81	21	20	11	9
3-34-6	683	Vacant	AR-1	1	19801160/2	0.44	1	1	1	0
3-34-6	686	Vacant	AR-1	1	19801160/2	0.44	1	1	1	0
3-34-6	490	Vacant	C-1		19801160/3	0.66		41	21	20
3-34-6	497	Vacant	C-1		19801160/3	20.71		1295	660	634
3-34-6	4.03	Vacant	C-1		19801180/1	0.6		38	19	18
3-34-6	4.04	Vacant	C-1		19801180/1	0.4		25	13	12
3-34-6	23	Vacant	C-1		19801180/1	5.19		324	165	159
3-34-6	36	Vacant	C-1		19801180/1	0.2		13	6	6
3-34-6	37	Vacant	C-1		19801180/1	0.4		25	13	12
3-34-6	39/1	Farmland	C-1		19801180/1	14.09		881	449	432
3-34-6	39/2	Farmland	AR-1	1	19801180/2	28.18	28	26	14	12
3-34-6	55	Vacant	AR-1	1	19801180/2	9.73	10	9	5	4
3-34-6	56	Vacant	AR-1	1	19801180/2	5.2	5	5	3	2
3-34-6	57	Vacant	AR-1	1	19801180/2	6.6	7	6	3	3
3-34-6	58	Vacant	AR-1	1	19801180/2	0.8	1	1	1	0
3-34-6	59	Vacant	AR-1	1	19801180/2	0.2	1	1	1	0
3-34-6	60	Vacant	AR-1	1	19801180/2	0.2	1	1	1	0
3-34-6	61	Vacant	AR-1	1	19801180/2	0.4	1	1	1	0
3-34-6	62	Vacant	AR-1	1	19801180/2	3.52	4	3	2	2
3-34-6	63.04	Vacant	AR-1	1	19801180/2	0.8	1	1	0	0
3-34-6	63.03	Vacant	C-1		19801180/2	1.58		99	50	48
3-34-6	70	Vacant	MR-RPC		20401160/2	6.5	26	24	13	11
3-34-6	66.02	Vacant/Farm	AR-1	1	20401160/3	26.29	26	25	13	12
3-34-6	68	Vacant	AR-1	1	20401160/3	2.58	3	2	1	5
3-34-7	3	Vacant	GR	1	20401160/2	0.18	1	1	1	0
3-34-7	12.04	Vacant	GR	1	20401160/2	0.5	1	1	1	0
3-34-7	16.02	Vacant	AR-1	1	20801140/1	0.41	1	1	1	0

3-35-11	55	Vacant	AR-1		1	19401180/2	7.55	8	7	4	3
3-35-11	56	Vacant	AR-1		1	19401180/2	13.42	13	13	7	6
3-35-11	59	Vacant	AR-1		1	19401180/2	19.55	20	18	10	8
3-35-12	3 Part 2	Farmland	AR-1		1	20401160/3	300.36	300	282	152	129
3-35-7	6	Farmland	AR-1		1	18801200	82.88	83	78	42	36
3-35-7	7.02	Vacant	AR-1		1	18801200	3.09	3	3	2	1
3-35-7	7.04	Vacant	AR-1		1	18801200	2.48	2	2	1	1
3-35-7	34	Vacant	AR-1		1	18801200	1.00	1	1	1	0
3-35-7	35	Vacant	AR-1		1	18801200	1.00	1	1	1	0
3-35-7	36	Vacant	AR-1		1	18801200	1.00	1	1	1	0
3-35-7	37	Vacant	AR-1		1	18801200	1.00	1	1	1	0
3-35-7	38	Vacant	AR-1		1	18801200	1.00	1	1	1	0
3-35-7	part 1	Farmland	AR-1		1	18801200	160.00	160	150	81	69
3-35-8	2	Vacant	AR-1		1	18801200	138.06	138	130	70	60
3-35-8	27.06	Vacant	AR-1		1	19801200	1.64	2	2	1	1
3-35-8	27.03	Vacant	AR-1		1	19801200	1.76	2	2	1	1
3-35-8	27.05	Vacant	AR-1		1	19801200	1.80	2	2	1	1
3-35-8	27.04	Vacant	AR-1		1	19801200	7.66	8	7	4	3
3-35-8	27.07	Vacant	AR-1		1	19801200	10.00	10	9	5	4
3-35-8	27.09	Vacant	AR-1		1	19801200	11.30	11	11	6	5
3-35-8	27.08	Vacant	AR-1		1	19801200	9.10	9	9	5	4
3-35-8	part 26	Farmland	AR-1		1	19801200	40.00	40	38	20	17
3-35-8	51	Farmland	AR-1		1	20401240	43.71	44	41	22	19
3-35-8	part 53	Farmland	AR-1		1	20401240	45.00	45	42	23	19
3-35-8	50.02	Vacant	AR-1		1	20401240	4.68	5	4	2	2
3-35-8	47	Farmland	AR-1		1	20401240	8.00	8	8	4	3
3-35-8	48	Farmland	AR-1		1	20401240	16.00	16	15	8	7
3-35-8	36	Farmland	AR-1		1	20401240	12.71	13	12	6	5
3-35-9	1.01	Vacant	AR-1		1	20401240	22.50	23	21	11	10
3-35-9	9	Vacant	AR-1		1	20401240	8.51	9	8	4	4
								TOTAL	11295	**5916**	**5378**

Table 5 - Entering and Exiting Trips by TAZs for Vacant Parcels and Farmlands Outside the Activity Centers

New Split TAZ	Entering Trips	Exiting Trips
18201180	6	5
18601120/1	0	0
18601120/2	251	213
18801180/1	235	226
18801180/2	87	74
18801200	649	578
19001120	256	218
19401080/1	53	42
19401080/2	300	256
19401140/1	3	2
19401140/2	106	89
19401180/1	0	0
19401180/2	142	134
19601120	170	145
19801160/1	207	199
19801160/2	46	35
19801160/3	681	655
19801180/1	666	640
19801180/2	81	72
19801180/3	0	0
19801200	42	36
20201040/1	183	156
20201040/2	18	15
20201040/3	36	27
20201040/4	5	3
20201120	41	35
20401140/1	0	0
20401140/2	0	0
20401160/1	0	0
20401160/2	15	11
20401160/3	167	147
20401220	82	70
20401240	0	0
20601120/1	0	0
20601120/2	0	0
20601120/3	0	0
20601120/4	90	77
20601140	1	1
20801040/1	0	0
20801040/2	3	1
20801040/3	8	3

20801040/4	131	111
20801040/5	0	0
20801040/6	30	26
20801040/7	0	0
20801040/8	0	0
20801040/9	304	292
20801040/10	372	357
20801120/1	36	34
20801120/2	0	0
20801120/3	27	23
20801120/4	19	18
20801140/1	1	1
21001141	0	0
21001142	0	0
21401100/1	0	0
21401100/2	366	351
21601060	0	0
21801080	0	0
21801100	0	0
Total	**5916**	**5378**

IV. Total Trip Generation by Study Area TAZs:

As discussed earlier, the total trip generation by TAZs for the Activity Center Scenario (see **Table 6**) is sum of the following three components:

a) Trip generation for the Base Land Use Scenario (Table 1).
b) Trip Generation for the activity centers (Table 2).
c) Trip Generation for the vacant land/farmland outside the activity centers (Table 5).

Table 6 - Total Entering and Exiting Trips by TAZs for the Activity Center/Village Scenario

New Split TAZ	Entering Trips	Exiting Trips
18201180	6	5
18601120/1	0	0
18601120/2	408	358
18801180/1	235	226
18801180/2	142	121
18801200	649	578
19001120	256	218
19401080/1	53	42
19401080/2	300	256
19401140/1	244	208
19401140/2	283	253
19401180/1	0	0
19401180/2	440	387
19601120	552	498
19801160/1	1049	1008
19801160/2	55	44
19801160/3	691	662
19801180/1	706	679
19801180/2	81	72
19801180/3	14	23
19801200	42	36
20201040/1	1088	991
20201040/2	18	15
20201040/3	391	152
20201040/4	5	3
20201120	517	460
20401140/1	881	845
20401140/2	111	94
20401160/1	0	0
20401160/2	72	60
20401160/3	739	675
20401220	368	334
20401240	242	223
20601120/1	0	0
20601120/2	0	0
20601120/3	0	0
20601120/4	120	103
20601140	506	468
20801040/1	996	937
20801040/2	3	1

20801040/3	33	25
20801040/4	204	174
20801040/5	0	0
20801040/6	134	114
20801040/7	0	0
20801040/8	0	0
20801040/9	304	290
20801040/10	394	392
20801120/1	322	317
20801120/2	0	0
20801120/3	27	23
20801120/4	278	264
20801140/1	17	15
21001141	0	0
21001142	0	0
21401100/1	0	0
21401100/2	406	378
21601060	0	0
21801080	0	0
21801100	0	0
Total	**14382**	**13027**

Note: These trips do not include the internal trips associated with the activity centers.

SUMMARY OF TRIP GENERATION FOR THE ACTIVITY CENTER SCENARIO:

- Trip generation for the Activity Center/Village Scenario:

  = 14,382 (entering) + 13,027 (exiting) ------------------------------------ Table 6

  = 27,409 trips.

  These trips should be used for conducting inter-zonal distribution.

- Total internal trips associated with the five activity centers:

  = 2,168 (entering) + 1,962 (exiting) --------------------------------------- Table 3

  = 4,130 internal trips.

  If the activity center is located within one single TAZ, then these trips should not be considered while carrying out inter-zonal trip distribution. If the activity center is shared between two or more TAZs then the internal trips should distributed only among the TAZs on which the activity center is located.

COMPARISON WITH THE EXPANDED DEVELOPMENT DISTRICT SCENARIO TRIP GENERATION:

- Total trip generation for the Expanded Development District Scenario:

  = 18,470 (entering) + 16,372 (exiting) --------------------------Table 4 of previous Tech. Memo. Dated April 8,2002.

  = 34,842 trips

- Trip generation for the Activity Center/Village Scenario:

  = 14,382 (entering) + 13,027 (exiting) ----------------------------------- Table 6

  = 27,409 trips.

- Reduction in trips for the Activity Center Scenario as compared to the Expanded Development District Scenario:

  = 34,842 – 27,409

  = 7,433 trips

Reduced 7,433 trips

4,130 internal trips

3,303 trips reduced due to change in the trip rates for some residential units.**

** In the Activity Center Scenario, there are 3 types of residential units in each activity center (Single Family detached housing, Condominiums, and apartment) whereas, in the Expanded Development District Scenario, most of the residential parcels are Single Family detached housing. Saturday peak hour trip rate for condominium (0.47 per DU) and apartments (0.52 per DU) is less than that of SF detached housing (0.94 per DU). As a result of this, 3,303 trips have been reduced in the Activity Center Scenario as compared to the Development District Scenario.

SR1 Land Use & Transportation Study
A joint effort of Sussex County and DelDOT

State Route 1 Land Use/Transportation Study

Technical Memorandum

G. Activity Center Alternatives Comparison

Prepared For:
Delaware Department of Transportation
DelDOT

Prepared By:
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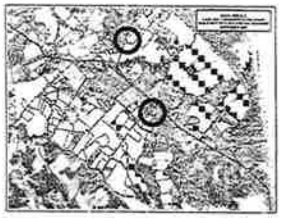
DMJM HARRIS

Activity Center Alternative 1: Only 2 Activity Centers Within the Study Area (A2, A4)



- Control total for the new residential development within the study area = 17,881 ---------(1)

- New residential development within Activity Centers A2 and A4 = 1,621 + 3,525
  = 5,146 ----------------(2)

- New residential development outside Activity Centers = (1) - (2)
  = 17,881 - 5,146
  = 12,735 --------------------------(3)

→ Vacant residential land outside Activity Centers within Development District = 2,162 acres

With permissible development density 4 DUs per acre:
Total new residential units outside Activity Centers within Development District = 2,162 x 4
= 8,648 -----(4)

→ Vacant residential land outside Activity Centers & outside Development District = 3,696 acres

Based on control total limitation,

(Total new residential units outside Activity Centers outside Development District)	=	(Total new residential units outside Activity Centers)	-	(New residential units outside Activity Centers within Dev. District)
(Total new residential units outside Activity Centers outside Development District)	=	12,735	-	8,648
	=	4,087 --(5)		

- Thus, development density for vacant residential land outside Activity Centers & outside Dev.District

= 4,087 / 3,696

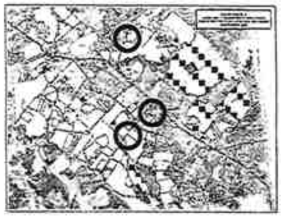
= 1.106 DUs per acre

- **Trip generation for alternative 1** = **(Base Land Use Scenario Trip Generation) + (Trip Generation associated with Activity Centers A2 and A4 excluding internal trips) + (Trip generation associated with vacant land outside Activity Centers- see Table 1)**

  = **9,300 + 2,965 + 20,518**

  = **32,783 trips**

Activity Center Alternative 2: Only 3 Activity Centers Within the Study Area (A1, A2, A4)



- Control total for the new residential development within the study area = 17,881 ---------(1)

- New residential development within Activity Centers A1, A2 and A4 = 3,700 + 1,621 + 3,525
  = 8,846 ----------------(2)

- New residential development outside Activity Centers = (1) - (2)
  = 17,881 - 8,846
  = 9,035 --------------------------(3)

→ Vacant residential land outside Activity Centers within Development District = 2,084 acres

Permissible development density is up to 4 DUs per acre:
If 4 DUs per acre density was used, then density outside dev. District would be very negligible (0.2)
Hence, a dev. density of 3 DUs/acre was used for vacant parcels within dev. district outside Centers.
Total new residential units outside Activity Centers within Development District = 2,084 x 3
= 6,252 -----(4)

→ Vacant residential land outside Activity Centers & outside Development District = 3,386 acres

Based on control total limitation,

(Total new residential units outside Activity Centers outside Development District)	=	(Total new residential units outside Activity Centers)	-	(New residential units outside Activity Centers within Dev. District)
(Total new residential units outside Activity Centers outside Development District)	=	9,035	-	6,252
	=	2,783 ---(5)		

→ **Thus, development density for vacant residential land outside Activity Centers & outside Dev.District**

= 2,783 / 3,386

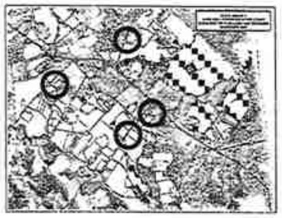
= 0.82 DUs per acre

- **Trip generation for alternative 2 = (Base Land Use Scenario Trip Generation) + (Trip Generation associated with Activity Centers A1, A2 and A4 excluding internal trips) + (Trip generation associated with vacant land outside Activity Centers- see Table 2)**

  = 9,300 + 4,816 + 17,056

  = 31,172 trips

Activity Center Alternative 3: Only 4 Activity Centers Within the Study Area (A1, A2, A3, A4)



- Control total for the new residential development within the study area = 17,881 ---------(1)

- New residential development within Activity Centers A1, A2, A3, and A4
  = 3,700 + 1,621 + 1,280 + 3,525
  = 10,126 ----------------(2)

- New residential development outside Activity Centers = (1) - (2)
  = 17,881 - 10,126
  = 7,755 ---------------------------(3)

→ Vacant residential land outside Activity Centers within Development District = 2,029 acres

Permissible development density is up to 4 DUs per acre:
If 4 DUs per acre density was used, then density outside dev. District would be zero.
Hence, a dev. density of 2 DUs/acre was used for vacant parcels within dev. district outside Centers.
Total new residential units outside Activity Centers within Development District = 2,029 x 2
= 4,058 -----(4)

→ Vacant residential land outside Activity Centers & outside Development District = 3,304 acres

Based on control total limitation,

(Total new residential units outside Activity Centers outside Development District)	=	(Total new residential units outside Activity Centers)	-	(New residential units outside Activity Centers within Dev. District)
(Total new residential units outside Activity Centers outside Development District)	=	7,755	-	4,058
	=	3,697 --(5)		

→ Thus, development density for vacant residential land outside Activity Centers & outside Dev.District

= 3,697 / 3,304

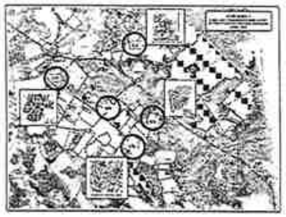
= 1.12 DUs per acre

- Trip generation for alternative 2 = (Base Land Use Scenario Trip Generation) + (Trip Generation associated with Activity Centers A1, A2, A3 and A4 excluding internal trips) + (Trip generation associated with vacant land outside Activity Centers- see Table 3)

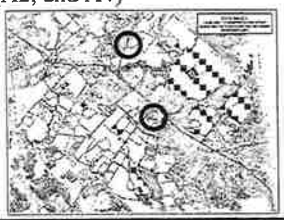
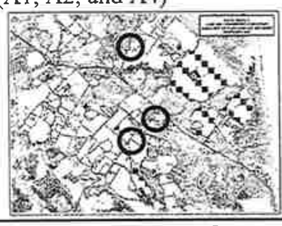
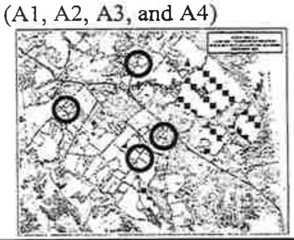
  = 9,300 + 5,459 + 15,681

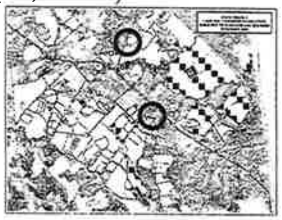
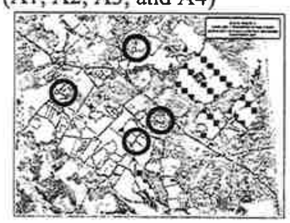
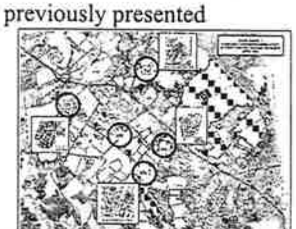
  = 30,440 trips

Activity Center Alternative 4: All 5 Activity Centers as Previously Tested



Please refer to the trip generation calculations and land assembly exercise done previously for this alternative.

Activity Center Alternatives	New Residential Development	New Residential Development inside Activity Centers		New Residential Development outside Activity Centers					Internal Trips	Trip Generation		
		Units	Density (DUs/ Acre)	Total Units	Units within Dev. District	Density within Dev. District (DUs/ Acre)	Units outside Dev. District	Density outside Dev. District (DUs/ Acre)		Entering Trips	Exiting Trips	Total Trip Generation
With only 2 Activity Centers (A2, and A4) 	17,881 Units	**5,146 Units**	9.60 Avg.	**12,735 Units**	8,648 Units	4.00	4,087 Units	1.11	**1,526**	17,290	15,493	**32,783**
With only 3 Activity Centers (A1, A2, and A4) 	17,881 Units	**8,846 Units**	9.60 Avg.	**9,035 Units**	6,252 Units	3.00	2,783 Units	0.82	**2,628**	16,399	14,773	**31,172**
With only 4 Activity Centers (A1, A2, A3, and A4) 	17,881 Units	**10,126 Units**	9.60 Avg.	**7,755 Units**	4,058 Units	2.00	3,697 Units	1.12	**3,004**	16,102	14,338	**30,440**
With all 5 Activity Centers as previously presented 	18,103 Units	**12,970 Units**	9.60 Avg.	**5,133 Units**	1,635 Units	1.00	3,498	1.00	**4,130**	14,382	13,027	**27,409**

Activity Center Alternatives	Implications
With only 2 Activity Centers (A2, and A4) 	• Less internal trips, highest trip generation among the four activity center alternatives; comparatively more burden on the study area transportation network. • Activity Centers are based on neighborhood shopping concept and intended to reduce the local residents' need to access the SR1 Corridor for their day-to-day shopping needs. These centers are likely to attract trips from within the centers and from immediate periphery. With only two activity centers, majority of the local residents in the study area would still require to access the SR1 Corridor for their neighborhood shopping needs, thus serving the purpose of the activity center concept on a very limited basis. • With development density within the development district still at 4 DUs per acre, the traffic impacts on the roadway network in the vicinity of the SR1 Corridor remain the same as that of all previous land use scenarios. • Only two activity centers imply continued suburban sprawl.
With only 3 Activity Centers (A1, A2, and A4) 	• Higher internal trips and slightly less trip generation compared to the first alternative; moderate impact on the transportation system within the study area. • Although one additional activity center (A1) compared to the first alternative, it is located in the immediate vicinity of another activity center (A2). Thus, many local residents, mainly in the north-west portion of the study area, would still require accessing the SR1 Corridor for their neighborhood shopping needs and the purpose of the activity center concept would be served on a limited basis.
With only 4 Activity Centers (A1, A2, A3, and A4) 	• Slight increase in the number of internal trips and small decrease in the trip generation compared to the second alternative; moderate impact on the study area transportation system. • Activity center locations well spread out in the study area and thus, provide neighborhood shopping opportunity for local residents from most of the parts of the study area. This would result in a considerable reduction in the necessity for local residents to access SR1 for day-to-day shopping. • Development density outside the activity centers can be reduced considerably. This alternative has 2 DUs per acre density within the development district outside activity centers whereas development density outside the development district outside activity centers is close to 1. This implies limited suburban sprawl.
With all 5 Activity Centers as previously presented 	• Significant number of internal trips and lowest trip generation among all four alternatives; implies minimum traffic impact on the study area roadway system. • Well spread activity center locations in the study area. It would provide neighborhood-shopping opportunity to majority of the local residents. • Development density outside activity centers is 1 DU per acre irrespective of within or outside the development district. This represents a compact, mixed-use land use pattern for the entire study area.

State Route 1 Land Use/Transportation Study

Technical Memorandum

H. Preferred Land Use Scenario Trip Generation

Prepared For:
Delaware Department of Transportation

DelDOT

Prepared By:
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I. Introduction:

The purpose of this technical memorandum is to present total trip generation for the Saturday peak hour by TAZs for the Preferred Activity Center Scenario.

II. Trip Generation Calculations:

The total trip generation for the Activity Center Scenario is sum of the following three components:

a) Trip generation for the Base Land Use Scenario.
b) Trip Generation for the activity centers.
c) Trip Generation for the vacant land/farmland outside the activity centers.

a) Trip generation for the Base Land Use Scenario:

Table 1 shows the total number of entering and exiting trips by TAZs for the Base Land Use Scenario.

Table 1 - Total Entering and Exiting Trips by TAZs For the Base Land Use Scenario

New Split TAZ	Entering Trips	Exiting Trips
18601120/1	0	0
18601120/2	0	0
18801180/1	0	0
18801180/2	55	47
19001120	0	0
19401080/1	0	0
19401080/2	0	0
19401140/1	241	206
19401140/2	0	0
19401180/1	0	0
19401180/2	298	253
19601120	0	0
19801160/1	842	809
19801160/2	9	9
19801160/3	10	9
19801180/1	40	39
19801180/2	0	0
19801180/3	14	23
19801200	0	0

20201040/1	0	0
20201040/2	0	0
20201040/3	355	125
20201040/4	0	0
20201120	105	80
20401140/1	882	845
20401140/2	111	94
20401160/1	0	0
20401160/2	57	49
20401160/3	0	0
20401220	0	0
20401240	0	0
20601120/1	0	0
20601120/2	0	0
20601120/3	0	0
20601120/4	30	26
20601140	62	59
20801040/1	976	937
20801040/2	0	0
20801040/3	25	22
20801040/4	73	63
20801040/5	0	0
20801040/6	104	88
20801040/7	0	0
20801040/8	0	0
20801040/9	0	0
20801040/10	22	35
20801120/1	286	283
20801120/2	0	0
20801120/3	0	0
20801120/4	259	246
20801140/1	16	14
21001141	0	0
21001142	0	0
21401100/1	0	0
21401100/2	40	27
21601060	0	0
21801080	0	0
21801100	0	0
Total	**4912**	**4388**

b) Trip Generation for the Activity Centers:

Basic assumptions made while conducting the trip generation for the activity centers remain the same as the ones used in the previous activity center scenario:

1. Activity Center 1 (A1):

Geographic Location: located between SR24 and RD274 adjacent to school.

Area: 386.20 Acres

Shared between: 3 TAZs (20201040/1: 94%, 20201120: 6%, 20201040/4: Negligible)

Intended Development & Trip Generation:

Intended Development	Trip Generation	Entering Trips	Exiting Trips
3,700 DUs:			
841 SF Detached	791	427	364
1,135 Condos	533	288	245
1,724 Apartments	896	448	448
95,832 sq.ft. GFA of retail/commercial establishments	734	374	360
Total	2,954	1,537	1,417

Internal Trips:

75% of 734 retail/commercial trips = 551
Equal portion of internal trip ends from residential units (as discussed in assumptions) = 551

Total internal trips: 1,102

Trip Generation by TAZs (Excluding the internal trips)

New Split TAZ	Entering Trips	Exiting Trips
20201040/1	905	835
20201120	58	53
20201040/4	-	-
Total Trips Excluding Internal Trips	963	888

2. Activity Center 2 (A2):

Geographic Location: located between SR24 and RD274 adjacent to the Medical Center.

Area: 172.25 Acres

Located within: 1 TAZs (20601140)

Intended Development & Trip Generation:

Intended Development	Trip Generation	Entering Trips	Exiting Trips
1,621 DUs:			
374 SF Detached	352	190	162
499 Condos	235	127	108
748 Apartments	389	195	194
32,670 sq.ft. GFA of retail/commercial establishments	250	128	122
Total	1,226	640	586

Internal Trips:

75% of 250 retail/commercial trips = 188
Equal portion of internal trip ends from residential units (as discussed in assumptions) = 188

Total internal trips: 376

Trip Generation by TAZs (Excluding the internal trips)

New Split TAZ	Entering Trips	Exiting Trips
20601140	442	408
Total Trips Excluding Internal Trips	442	408

3. Activity Center 3 (A3):

Geographic Location: located between SR23 and US9.

Area: 136.48 Acres

Shared between: 2 TAZs (18601120/2: 47%, 19401140/2: 53%)

Intended Development & Trip Generation:

Intended Development	Trip Generation	Entering Trips	Exiting Trips
1,280 DUs:			
295 SF Detached	277	150	127
394 Condos	185	100	85
591 Apartments	307	154	153
32,670 sq.ft. GFA of retail/commercial establishments	250	128	122
Total	1,019	532	487

Internal Trips:

75% of 250 retail/commercial trips = 188
Equal portion of internal trip ends from residential units (as discussed in assumptions) = 188

Total internal trips: 376

Trip Generation by TAZs (Excluding the internal trips)

New Split TAZ	Entering Trips	Exiting Trips
18601120/2	157	145
19401140/2	177	164
Total Trips Excluding Internal Trips	334	309

4. Activity Center 5 (A5):

Geographic Location: located at the intersection of RD283 and RD275.

Area: 288.53 Acres

Shared between: 2 TAZs (19601120: 55%, 20201120: 45%)

Intended Development & Trip Generation:

Intended Development	Trip Generation	Entering Trips	Exiting Trips
2,844 DUs:			
656 SF Detached	617	333	284
875 Condos	411	222	189
1,313 Apartments	683	342	341
98,010 sq.ft. GFA of retail/commercial establishments	751	383	368
Total	2,462	1,280	1,182

Internal Trips:

75% of 751 retail/commercial trips = 563
Equal portion of internal trip ends from residential units (as discussed in assumptions) = 563

Total internal trips: 1,126

Trip Generation by TAZs (Excluding the internal trips)

New Split TAZ	Entering Trips	Exiting Trips
19601120	382	353
20201120	313	292
Total Trips Excluding Internal Trips	695	641

Table 2 summarizes the inter-zonal trips associated with all the activity centers (w/o internal trips) by TAZs.

Table 3 shows the total internal trips for all the activity centers. As discussed earlier in the assumptions, if the activity center is located within one single TAZ, then internal trips should not be considered while carrying out inter-zonal trip distribution. If the activity center is shared between two or more TAZs then the internal trips should distributed only among the TAZs on which the activity center is located.

Table 2 – Total Entering and Exiting Trips by TAZs for the Activity Centers (Excluding Internal Trips) The Preferred Activity Center Scenario

New Split TAZ	Entering Trips	Exiting Trips
18201180	0	0
18601120/1	0	0
18601120/2	157	145
18801180/1	0	0
18801180/2	0	0
18801200	0	0
19001120	0	0
19401080/1	0	0
19401080/2	0	0
19401140/1	0	0
19401140/2	177	164
19401180/1	0	0
19401180/2	0	0
19601120	382	353
19801160/1	0	0
19801160/2	0	0
19801160/3	0	0
19801180/1	0	0
19801180/2	0	0
19801180/3	0	0
19801200	0	0
20201040/1	905	835
20201040/2	0	0
20201040/3	0	0
20201040/4	0	0
20201120	371	345
20401140/1	0	0
20401140/2	0	0
20401160/1	0	0
20401160/2	0	0
20401160/3	0	0
20401220	0	0
20401240	0	0
20601120/1	0	0
20601120/2	0	0

20601120/3	0	0
20601120/4	0	0
20601140	443	408
20801040/1	0	0
20801040/2	0	0
20801040/3	0	0
20801040/4	0	0
20801040/5	0	0
20801040/6	0	0
20801040/7	0	0
20801040/8	0	0
20801040/9	0	0
20801040/10	0	0
20801120/1	0	0
20801120/2	0	0
20801120/3	0	0
20801120/4	0	0
20801140/1	0	0
21001141	0	0
21001142	0	0
21401100/1	0	0
21401100/2	0	0
21601060	0	0
21801080	0	0
21801100	0	0
Total	**2,435**	**2,250**

Table 3
Total Entering and Exiting Internal Trips Associated with the Activity Centers

Activity Center	Total Internal Trips	Entering Trips	Existing Trips
A1	1,102	579	523
A2	376	197	179
A3	376	197	179
A5	1,126	591	535
Total	2,980	1,564	1,416

c) Trip Generation for the Vacant Land/Farmland outside the Activity Centers:

Table 4 shows the details of the vacant land/farmland parcels outside the activity centers in the Preferred Activity Center Scenario and trip generation (with entering trips and exiting trips split) for these parcels.

Table 5 summarizes the entering and exiting trips associated with the vacant land/farmland outside the activity centers by TAZs.

Table 4: Trip Generation for Vacant Parcels and Farmlands Outside the Activity Centers

Map #	Map Parcel #	Status Code	Zoning	Within Activity Center	TAZ #	Area (acres)	Units	Trip Gen.	Entering Trips	Exiting Trips
				Codes: 4=Yes, 1=No						
3-34-1	9	Vacant	AR-1	1	18801200	391.17	391	368	199	169
3-34-1	15.02	Vacant	AR-1	1	18801200	3.74	4	4	2	2
3-34-1	15.03	Vacant	AR-1	1	18801200	3.74	4	4	2	2
3-34-1	16	Vacant	AR-1	1	18801200	1.23	1	1	1	1
3-34-1	16.01	Vacant	AR-1	1	18801200	0.24	1	1	1	0
3-34-1	16.05	Vacant	AR-1	1	18801200	1.27	1	1	1	1
3-34-1	16.07	Vacant	AR-1	1	18801200	1.23	1	1	1	1
3-34-1	16.08	Vacant	AR-1	1	18801200	1.23	1	1	1	1
3-34-1	16.09	Vacant	AR-1	1	18801200	1.23	1	1	1	1
3-34-1	16.1	Vacant	AR-1	1	18801200	1.23	1	1	1	1
3-34-1	27.01	Vacant	AR-1	1	18801200	4.94	5	5	3	2
3-34-1	4	Vacant	C-1		18801200	2.43		152	77	74
3-34-1	6.07	Vacant	C-1		18801200	1.07		67	34	33
3-34-1	6.01	Vacant	C-1		18801200	1.00		63	32	31
3-34-1	6.06	Vacant	C-1		18801200	1.35		84	43	41
3-34-1	6	Vacant	C-1		18801200	1.34		84	43	41
3-34-11	3.01	Farmland	AR-1	1	19001120	46.41	46	44	24	20
3-34-11	5	Farmland	AR-1	1	19001120	248.75	249	234	126	108
3-34-11	7	Farmland	AR-1	1	19001120	21.13	21	20	11	9
3-34-11	7.03	Farmland	AR-1	1	19001120	21	21	20	11	9
3-34-11	7.04	Farmland	AR-1	1	19001120	32.07	32	30	16	14
3-34-11	7.05	Farmland	AR-1	1	19001120	10.94	11	10	6	5
3-34-11	8	Farmland	AR-1	1	19001120	44.1	44	41	22	19
3-34-11	21	Farmland	AR-1	1	19001120	17.15	17	16	9	7
3-34-11	22	Farmland	AR-1	1	19001120	17.2	17	16	9	7
3-34-11	Adjoining 22	Farmland	AR-1	1	19001120	28.2	28	27	14	12
3-34-11	12	Vacant	GR	1	19001120	0.53	1	0	0	0
3-34-11	13	Vacant	GR	1	19001120	0.81	1	1	0	0
3-34-11	20	Farmland	GR	1	19001120	6.13	6	6	3	3
3-34-11	25	Farmland	GR	1	19001120	10.72	11	10	5	5

3-34-11	46/1	Farmland	AR-1		1	19601120	12.6	13	12	6	5
3-34-11	46/2	Farmland	AR-1		1	19601120	40	40	38	20	17
3-34-11	Adjoining 47	Vacant	AR-1		1	19601120	0.6	1	1	1	0
3-34-11	Adjoining 47	Vacant	AR-1		1	19601120	0.6	1	1	1	0
3-34-11	Adjoining 47	Vacant	AR-1		1	19601120	0.6	1	1	1	0
3-34-11	Adjoining 47	Vacant	AR-1		1	19601120	0.4	1	1	1	0
3-34-11	49	Vacant	AR-1		1	19601120	2.53	5	5	3	2
3-34-11	81	Farmland	AR-1		1	19601120	48.33	48	45	25	21
3-34-11	81.01	Vacant	AR-1		1	19601120	0.75	1	1	1	0
3-34-11	81.02	Vacant	AR-1		1	19601120	0.75	1	1	1	0
3-34-11	81.03	Vacant	AR-1		1	19601120	0.75	1	1	1	0
3-34-11	81.04	Vacant	AR-1		1	19601120	0.75	1	1	1	0
3-34-11	83	Farmland	AR-1		1	19401080/2	97.4	97	92	49	42
3-34-11	86	Farmland	AR-1		1	19401080/2	39.2	39	37	20	17
3-34-11	98.01	Vacant	GR		1	19401080/2	0.14	1	1	1	0
3-34-11	98.02	Vacant	GR		1	19401080/2	0.14	1	1	1	0
3-34-11	29	Farmland	AR-1		1	19401140/2	32.44	32	30	16	14
3-34-11	42	Vacant	AR-1		1	19401140/2	9.4	19	18	10	8
3-34-11	43	Farmland	AR-1		1	19401140/2	53.45	53	50	27	23
3-34-11	43.01	Farmland	AR-1		1	19401140/2	35	35	33	18	15
3-34-11	45	Farmland	AR-1		1	19401140/2	61.7	62	58	31	27
3-34-11	28	Vacant	GR		1	19401140/2	0.14	1	1	1	0
3-34-11	30	Vacant	GR		1	19401140/2	3	3	3	2	1
3-34-11	31	Vacant	GR		1	19401140/2	0.12	1	1	1	0
3-34-11	41	Vacant	GR		1	19401140/2	0.69	1	1	1	0
3-34-12	6.01/2	Farmland	AR-1		1	19601120	15.88	16	15	8	7
3-34-12	8	Vacant	AR-1		1	19601120	4	8	8	4	3
3-34-12	9	Vacant	AR-1		1	19601120	1	2	2	1	1
3-34-12	10.01	Vacant	AR-1		1	19601120	2.4	5	5	3	2
3-34-12	11	Vacant	AR-1		1	19601120	1.04	2	2	1	1
3-34-12	13/1	Farmland	AR-1		1	19601120	93.66	94	88	48	40
3-34-12	13.01	Farmland	AR-1		1	19601120	66.84	67	63	34	29
3-34-12	46	Farmland	AR-1		1	20201120	37.11	37	35	19	16

3-34-12	48.02	Vacant	AR-1		1	20201120	0.53	1	0	0	0
3-34-12	48.03	Vacant	AR-1		1	20201120	0.03	1	1	1	0
3-34-12	50	Vacant	AR-1		1	20201120	1	1	1	1	0
3-34-12	57.01	Farmland	AR-1		1	20201120	8.76	9	8	4	4
3-34-12	57.04	Farmland	AR-1		1	20201120	32.79	33	31	17	14
3-34-12	123.02/1	Vacant	B-1			20601140	1	4	2	1	1
3-34-12	16/2	Farmland	AR-1		1	19401080/2	239.84	240	225	122	104
3-34-12	17	Farmland	AR-1		1	19401080/2	67.4	67	63	34	29
3-34-12	17.01	Vacant	AR-1		1	19401080/2	0.5	1	1	1	0
3-34-12	19	Farmland	AR-1		1	19401080/2	51	51	48	26	22
3-34-12	22	Farmland	AR-1		1	19401080/2	6	6	6	3	3
3-34-12	44	Vacant	AR-1		1	19401080/2	0.28	1	1	1	0
3-34-12	45.01	Vacant	AR-1		1	19401080/2	0.63	1	1	1	0
3-34-12	15.07	Vacant	GR		1	19401080/2	0.43	1	1	1	0
3-34-12	16/1	Farmland	GR		1	19401080/2	84.35	84	79	43	36
3-34-12	116	Farmland	AR-1		1	20201040/1	43	43	40	22	19
3-34-12	122.03	Farmland	AR-1		1	20201040/2	34.65	35	33	18	15
3-34-13	335	Farmland	AR-1		1	20601120/4	8.47	8	8	4	4
3-34-13	334	Farmland	MR		1	20601120/4	51.67	52	49	26	22
3-34-13	334.01	Farmland	MR		1	20601120/4	60.23	60	57	31	26
3-34-13	334.02	Farmland	MR		1	20601120/4	27.25	27	26	14	12
3-34-13	334.03	Farmland	MR		1	20601120/4	15	15	14	8	6
3-34-13	334.04	Farmland	MR		1	20601120/4	15	15	14	8	6
3-34-13	325.18	Vacant	C-1			20801040/10	11.66		729	372	357
3-34-13	164.01	Vacant	AR-1		1	20801040/2	0.68	1	1	1	0
3-34-13	171.01	Vacant	AR-1		1	20801040/2	1.51	2	1	1	1
3-34-13	171.02	Vacant	AR-1		1	20801040/2	1.25	1	1	1	0
3-34-13	185.01	Vacant	AR-1		1	20801040/2	0.5	1	1	1	0
3-34-13	325.07	Vacant	MR		1	20801040/6	1.98	8	8	4	4
3-34-13	319	Vacant	C-1			20801040/9	0.46		29	15	14
3-34-13	325.01	Vacant	C-1			20801040/9	4.83		302	154	148
3-34-13	325.24	Vacant	C-1			20801040/9	4.25		266	136	130
3-34-13	3	Vacant	C-1			20801120/1	0.5		31	16	15

3-34-13	8.04	Vacant	C-1		20801120/1	0.62		39	20	19
3-34-13	325	Farmland	AR-1	1	20801120/3	41.4	41	39	21	18
3-34-13	341	Vacant	AR-1	1	20801120/3	1	1	1	1	0
3-34-13	342	Vacant	AR-1	1	20801120/3	5.45	5	5	3	2
3-34-13	343	Vacant	AR-1	1	20801120/3	6.16	6	6	3	3
3-34-13	325.41	Vacant	C-1		20801120/4	0.6		38	19	18
3-34-13	106.01	Vacant	GR	1	20801140/1	0.41	1	1	1	0
3-34-13	325.28	Vacant	AR-1	1	21401100/2	3.19	3	3	2	1
3-34-13	325.08	Vacant	C-1		21401100/2	2.37		148	76	73
3-34-13	325.14	Vacant	C-1		21401100/2	2.35		147	75	72
3-34-13	325.15	Vacant	C-1		21401100/2	2.4		150	77	74
3-34-13	356	Vacant	C-1		21401100/2	0.6		38	19	18
3-34-13	360	Vacant	C-1		21401100/2	3.7		231	118	113
3-34-18	2	Farmland	AR-1	1	19401080/1	72.42	72	68	37	31
3-34-18	13	Farmland	AR-1	1	19401080/1	22.03	22	21	11	10
3-34-18	8	Vacant	MR	1	19401080/1	0.45	2	2	1	1
3-34-18	14	Vacant	MR	1	19401080/1	0.3	1	1	1	0
3-34-18	15	Vacant	MR	1	19401080/1	0.37	1	1	1	0
3-34-18	16	Vacant	MR	1	19401080/1	0.32	1	1	1	0
3-34-18	17	Vacant	MR	1	19401080/1	0.3	1	1	1	0
3-34-18	42/2	Farmland	AR-1	1	20201040/1	196.32	196	185	100	85
3-34-18	42.02	Vacant	AR-1	1	20201040/1	1.68	2	2	1	1
3-34-18	43 Part 2	Farmland	AR-1	1	20201040/1	120	120	113	61	52
3-34-18	31	Vacant	AR-1	1	20201040/3	3.84	4	4	2	2
3-34-18	38.05	Vacant	AR-1	1	20201040/3	2.16	2	2	1	1
3-34-18	40.01	Farmland	AR-1	1	20201040/3	36.3	36	34	18	16
3-34-18	564	Vacant	AR-1	1	20201040/3	1.05	1	1	1	0
3-34-18	565	Vacant	AR-1	1	20201040/3	1.08	1	1	1	0
3-34-18	566	Vacant	AR-1	1	20201040/3	2.41	2	2	1	1
3-34-18	567	Vacant	AR-1	1	20201040/3	1.31	1	1	1	0
3-34-18	568	Vacant	AR-1	1	20201040/3	1.48	1	1	1	0
3-34-18	569	Vacant	AR-1	1	20201040/3	1.48	1	1	1	0
3-34-18	570	Vacant	AR-1	1	20201040/3	1.78	2	2	1	1

3-34-18	571	Vacant	AR-1	1	20201040/3	2.16	2	2	1	1
3-34-18	572	Vacant	AR-1	1	20201040/3	2.19	2	2	1	1
3-34-18	573	Vacant	AR-1	1	20201040/3	1.79	2	2	1	1
3-34-18	574	Vacant	AR-1	1	20201040/3	1.54	2	1	1	0
3-34-18	575	Vacant	AR-1	1	20201040/3	1.91	2	2	1	1
3-34-18	576	Vacant	AR-1	1	20201040/3	1.46	1	1	1	0
3-34-18	577	Vacant	AR-1	1	20201040/3	1.7	2	2	1	1
3-34-18	578	Vacant	AR-1	1	20201040/3	1.73	2	2	1	1
3-34-18	579	Vacant	AR-1	1	20201040/3	1.53	2	1	1	0
3-34-18	581	Vacant	AR-1	1	20201040/3	1.07	1	1	1	0
3-34-18	582	Vacant	AR-1	1	20201040/3	1.06	1	1	1	0
3-34-18	47	Vacant	AR-1	1	20201040/4	1	1	1	1	0
3-34-18	48	Vacant	AR-1	1	20201040/4	0.17	1	1	1	0
3-34-18	78	Vacant	AR-1	1	20201040/4	3.8	4	4	2	2
3-34-18	200	Vacant	AR-1	1	20201040/4	3.18	3	3	2	1
3-34-18	416	Farmland	AR-1	1	20801040/4	36.6	37	34	19	16
3-34-18	417	Farmland	AR-1	1	20801040/4	32.8	33	31	17	14
3-34-18	418	Farmland	AR-1	1	20801040/4	45.9	46	43	23	20
3-34-19	10	Vacant	AR-1	1	20801040/3	0.19	1	1	1	0
3-34-19	13.03	Vacant	AR-1	1	20801040/3	0.22	1	1	1	0
3-34-19	13.04	Vacant	AR-1	1	20801040/3	0.22	1	1	1	0
3-34-19	18	Vacant	AR-1	1	20801040/3	0.1	1	1	1	0
3-34-19	20.01	Vacant	AR-1	1	20801040/3	0.2	1	1	1	0
3-34-19	21.01	Vacant	AR-1	1	20801040/3	0.1	1	1	1	0
3-34-19	21.04	Vacant	AR-1	1	20801040/3	0.32	1	1	1	0
3-34-19	21.07	Vacant	AR-1	1	20801040/3	0.08	1	1	1	0
3-34-19	21.08	Vacant	AR-1	1	20801040/3	1.67	2	2	1	1
3-34-19	21.1	Vacant	AR-1	1	20801040/3	0.44	1	1	1	0
3-34-19	21.6	Vacant	AR-1	1	20801040/3	0.39	1	1	1	0
3-34-19	1.03	Farmland	AR-1	1	20801040/4	82.6	83	78	42	36
3-34-19	1.05	Farmland	AR-1	1	20801040/4	59.2	59	56	30	26
3-34-19	154.01	Pending	MR	1	20801040/6	19	19	18	10	8
3-34-19	380.01	Vacant	MR	1	20801040/6	25.58	26	24	13	11

3-34-19	380.02	Vacant	MR		1	20801040/6	2.4	2	2	1	1
3-34-19	380.03	Vacant	MR		1	20801040/6	2.28	2	2	1	1
3-34-19	380.04	Vacant	MR		1	20801040/6	2.28	2	2	1	1
3-34-5	168	Vacant	AR-1		1	18201180	11.96	12	11	6	5
3-34-5	72.03	Vacant	AR-1		1	18801200	8.03	8	8	4	3
3-34-5	72.02	Farmland	AR-1		1	18801200	15.32	15	14	8	7
3-34-5	174	Farmland	AR-1		1	18601120/2	102.23	102	96	52	44
3-34-5	175/1	Farmland	AR-1		1	18601120/2	383.72	384	361	195	166
3-34-5	176	Vacant	AR-1			18601120/2	3.32	7	7	4	3
3-34-5	180	Vacant	AR-1		1	18601120/2	0.43	1	1	1	0
3-34-5	141	Vacant	C-1			18801180/1	2.44		153	78	75
3-34-5	143	Vacant	C-1			18801180/1	1.9		119	61	58
3-34-5	144.01	Vacant	C-1			18801180/1	0.43		27	14	13
3-34-5	147	Vacant	C-1			18801180/1	0.83		52	26	25
3-34-5	152.02	Vacant	C-1			18801180/1	1.32		83	42	40
3-34-5	152.03	Vacant	C-1			18801180/1	0.46		29	15	14
3-34-5	70	Farmland	AR-1		1	18801180/2	109.66	110	103	56	47
3-34-5	153	Farmland	AR-1		1	18801180/2	61.39	61	58	31	27
3-34-5	225.02	Vacant	AR-1		1	19401140/1	5.05	5	5	3	2
3-34-5	78	Vacant	C-1			19401180/2	0.42		26	13	13
3-34-5	80.02	Vacant	C-1			19401180/2	0.29		18	9	9
3-34-5	88	Vacant	C-1			19401180/2	0.76		48	24	23
3-34-5	90	Vacant	C-1			19401180/2	2.33		146	74	71
3-34-6	550	Vacant	AR-1		1	19601120	0.76	1	1	0	0
3-34-6	551.01	Vacant/Farm	AR-1		1	19601120	15	15	14	8	6
3-34-6	552	Farmland	AR-1		1	19601120	11.2	11	11	6	5
3-34-6	1257	Vacant	AR-1		1	19601120	0.48	1	1	1	0
3-34-6	1299	Vacant	AR-1		1	19401140/1	0.66	1	1	0	0
3-34-6	687	Vacant	C-1			19801160/1	6.49		406	207	199
3-34-6	500	Vacant	AR-1		1	19801160/2	2.9	3	3	1	1
3-34-6	502	Vacant	AR-1		1	19801160/2	0.7	1	1	1	0
3-34-6	503	Farmland	AR-1		1	19801160/2	26.36	26	25	13	11
3-34-6	504.02	Vacant	AR-1		1	19801160/2	10.5	11	10	5	5

3-34-6	504.05	Vacant	AR-1	1	19801160/2	1.88	2	2	1	1
3-34-6	504.06	Vacant	AR-1	1	19801160/2	1	1	1	1	0
3-34-6	511	Vacant	AR-1	1	19801160/2	4.92	5	5	2	2
3-34-6	511.04	Vacant	AR-1	1	19801160/2	0.16	1	1	1	0
3-34-6	523	Vacant/Farm	AR-1	1	19801160/2	14.62	15	14	7	6
3-34-6	526/2	Vacant	AR-1	1	19801160/2	20.81	21	20	11	9
3-34-6	683	Vacant	AR-1	1	19801160/2	0.44	1	1	1	0
3-34-6	686	Vacant	AR-1	1	19801160/2	0.44	1	1	1	0
3-34-6	490	Vacant	C-1		19801160/3	0.66		41	21	20
3-34-6	497	Vacant	C-1		19801160/3	20.71		1295	660	634
3-34-6	4.03	Vacant	C-1		19801180/1	0.6		38	19	18
3-34-6	4.04	Vacant	C-1		19801180/1	0.4		25	13	12
3-34-6	23	Vacant	C-1		19801180/1	5.19		324	165	159
3-34-6	36	Vacant	C-1		19801180/1	0.2		13	6	6
3-34-6	37	Vacant	C-1		19801180/1	0.4		25	13	12
3-34-6	39/1	Farmland	C-1		19801180/1	14.09		881	449	432
3-34-6	39/2	Farmland	AR-1	1	19801180/2	28.18	28	26	14	12
3-34-6	55	Vacant	AR-1	1	19801180/2	9.73	10	9	5	4
3-34-6	56	Vacant	AR-1	1	19801180/2	5.2	5	5	3	2
3-34-6	57	Vacant	AR-1	1	19801180/2	6.6	7	6	3	3
3-34-6	58	Vacant	AR-1	1	19801180/2	0.8	1	1	1	0
3-34-6	59	Vacant	AR-1	1	19801180/2	0.2	1	1	1	0
3-34-6	60	Vacant	AR-1	1	19801180/2	0.2	1	1	1	0
3-34-6	61	Vacant	AR-1	1	19801180/2	0.4	1	1	1	0
3-34-6	62	Vacant	AR-1	1	19801180/2	3.52	4	3	2	2
3-34-6	63.04	Vacant	AR-1	1	19801180/2	0.8	1	1	0	0
3-34-6	63.03	Vacant	C-1		19801180/2	1.58		99	50	48
3-34-6	70	Vacant	MR-RPC		20401160/2	6.5	26	24	13	11
3-34-6	66.02	Vacant/Farm	AR-1	1	20401160/3	26.29	26	25	13	12
3-34-6	68	Vacant	AR-1	1	20401160/3	2.58	3	2	1	5
3-34-7	3	Vacant	GR	1	20401160/2	0.18	1	1	1	0
3-34-7	12.04	Vacant	GR	1	20401160/2	0.5	1	1	1	0
3-34-7	16.02	Vacant	AR-1	1	20801140/1	0.41	1	1	1	0

3-35-11	55	Vacant	AR-1		1	19401180/2	7.55	8	7	4	3
3-35-11	56	Vacant	AR-1		1	19401180/2	13.42	13	13	7	6
3-35-11	59	Vacant	AR-1		1	19401180/2	19.55	20	18	10	8
3-35-12	3 Part 2	Farmland	AR-1		1	20401160/3	300.36	300	282	152	129
3-35-7	6	Farmland	AR-1		1	18801200	82.88	83	78	42	36
3-35-7	7.02	Vacant	AR-1		1	18801200	3.09	3	3	2	1
3-35-7	7.04	Vacant	AR-1		1	18801200	2.48	2	2	1	1
3-35-7	34	Vacant	AR-1		1	18801200	1.00	1	1	1	0
3-35-7	35	Vacant	AR-1		1	18801200	1.00	1	1	1	0
3-35-7	36	Vacant	AR-1		1	18801200	1.00	1	1	1	0
3-35-7	37	Vacant	AR-1		1	18801200	1.00	1	1	1	0
3-35-7	38	Vacant	AR-1		1	18801200	1.00	1	1	1	0
3-35-7	part 1	Farmland	AR-1		1	18801200	160.00	160	150	81	69
3-35-8	2	Vacant	AR-1		1	18801200	138.06	138	130	70	60
3-35-8	27.06	Vacant	AR-1		1	19801200	1.64	2	2	1	1
3-35-8	27.03	Vacant	AR-1		1	19801200	1.76	2	2	1	1
3-35-8	27.05	Vacant	AR-1		1	19801200	1.80	2	2	1	1
3-35-8	27.04	Vacant	AR-1		1	19801200	7.66	8	7	4	3
3-35-8	27.07	Vacant	AR-1		1	19801200	10.00	10	9	5	4
3-35-8	27.09	Vacant	AR-1		1	19801200	11.30	11	11	6	5
3-35-8	27.08	Vacant	AR-1		1	19801200	9.10	9	9	5	4
3-35-8	part 26	Farmland	AR-1		1	19801200	40.00	40	38	20	17
3-35-8	51	Farmland	AR-1		1	20401240	43.71	44	41	22	19
3-35-8	part 53	Farmland	AR-1		1	20401240	45.00	45	42	23	19
3-35-8	50.02	Vacant	AR-1		1	20401240	4.68	5	4	2	2
3-35-8	47	Farmland	AR-1		1	20401240	8.00	8	8	4	3
3-35-8	48	Farmland	AR-1		1	20401240	16.00	16	15	8	7
3-35-8	36	Farmland	AR-1		1	20401240	12.71	13	12	6	5
3-35-9	1.01	Vacant	AR-1		1	20401240	22.50	23	21	11	10
3-35-9	9	Vacant	AR-1		1	20401240	8.51	9	8	4	4
								TOTAL	11295	**5916**	**5378**

Table 5 - Entering and Exiting Trips by TAZs for Vacant Parcels and Farmlands Outside the Activity Centers

New Split TAZ	Entering Trips	Exiting Trips
18201180	6	5
18601120/1	0	0
18601120/2	251	213
18801180/1	235	226
18801180/2	87	74
18801200	649	578
19001120	256	218
19401080/1	53	42
19401080/2	300	256
19401140/1	3	2
19401140/2	106	89
19401180/1	0	0
19401180/2	142	134
19601120	170	145
19801160/1	207	199
19801160/2	46	35
19801160/3	681	655
19801180/1	666	640
19801180/2	81	72
19801180/3	0	0
19801200	42	36
20201040/1	183	156
20201040/2	18	15
20201040/3	36	27
20201040/4	5	3
20201120	41	35
20401140/1	0	0
20401140/2	0	0
20401160/1	0	0
20401160/2	15	11
20401160/3	167	147
20401220	82	70
20401240	0	0
20601120/1	0	0
20601120/2	0	0
20601120/3	0	0
20601120/4	90	77
20601140	1	1
20801040/1	0	0
20801040/2	3	1
20801040/3	8	3

20801040/4	131	111
20801040/5	0	0
20801040/6	30	26
20801040/7	0	0
20801040/8	0	0
20801040/9	304	292
20801040/10	372	357
20801120/1	36	34
20801120/2	0	0
20801120/3	27	23
20801120/4	19	18
20801140/1	1	1
21001141	0	0
21001142	0	0
21401100/1	0	0
21401100/2	366	351
21601060	0	0
21801080	0	0
21801100	0	0
Total	**5916**	**5378**

IV. Total Trip Generation by Study Area TAZs:

As discussed earlier, the total trip generation by TAZs for the Activity Center Scenario (see **Table 6**) is sum of the following three components:

a) Trip generation for the Base Land Use Scenario (Table 1).
b) Trip Generation for the activity centers (Table 2).
c) Trip Generation for the vacant land/farmland outside the activity centers (Table 5).

SUMMARY OF TRIP GENERATION FOR THE PREFERRED ACTIVITY CENTER SCENARIO:

- Trip generation for the Preferred Activity Center Scenario:

  = 16,000 (entering) + 14,446 (exiting) ------------------------------------ Table 6

  = 30,446 trips.

  These trips should be used for conducting inter-zonal distribution.

- Total internal trips associated with the activity centers:

  = 1,565 (entering) + 1,416 (exiting) --------------------------------------- Table 3

  = 2,980 internal trips.

COMPARISON WITH THE BUILD OUT TO PLAN SCENARIO TRIP GENERATION:

- Total trip generation for the Build Out to Plan Scenario:

  = 18,358 (entering) + 16,278 (exiting) ---------------------------Table 4 of previous Tech. Memo. Dated April 8,2002.

  = 34,636 trips

- Trip generation for the Preferred Activity Center Scenario:

  = 16,000 (entering) + 14,446 (exiting) ------------------------------------ Table 6

  = 30,446 trips.

- Reduction in trips for the Preferred Activity Center Scenario as compared to the Build Out to Plan Scenario:

  = 34,636 – 30,446

  = 4,190 trips

Reduced 4,190 trips

2,980 internal trips

1,210 trips reduced due to change in the trip rates for some residential units.**

** In the Preferred Activity Center Scenario, there are 3 types of residential units in each activity center (Single Family detached housing, Condominiums, and apartment) whereas, in the Build Out to Plan Scenario, most of the residential parcels are Single Family detached housing. Saturday peak hour trip rate for condominium (0.47 per DU) and apartments (0.52 per DU) is less than that of SF detached housing (0.94 per DU). As a result of this, 1,210 trips have been reduced in the Preferred Activity Center Scenario as compared to the Build Out to Plan Scenario.

Table 6 - Total Entering and Exiting Trips by TAZs for the Activity Center/Village Scenario
Preferred Activity Center Scenario

New SplitTAZ	Entering Trips	Exiting Trips
18201180	9	8
18601120/1	0	0
18601120/2	541	471
18801180/1	311	299
18801180/2	189	161
18801200	949	841
19001120	395	336
19401080/1	79	64
19401080/2	460	392
19401140/1	246	209
19401140/2	334	296
19401180/1	0	0
19401180/2	490	434
19601120	636	569
19801160/1	1115	1072
19801160/2	77	65
19801160/3	910	874
19801180/1	919	884
19801180/2	112	101
19801180/3	14	23
19801200	65	55
20201040/1	1187	1075
20201040/2	27	23
20201040/3	411	172
20201040/4	7	5
20201120	539	479
20401140/1	881	845
20401140/2	111	94
20401160/1	0	0
20401160/2	72	60
20401160/3	406	349
20401220	75	64
20401240	190	162
20601120/1	0	0
20601120/2	0	0
20601120/3	0	0
20601120/4	169	144
20601140	506	468
20801040/1	996	937
20801040/2	3	1
20801040/3	33	25
20801040/4	274	234
20801040/5	0	0
20801040/6	148	126
20801040/7	0	0
20801040/8	0	0
20801040/9	402	383
20801040/10	513	504

20801120/1	333	328
20801120/2	0	0
20801120/3	42	36
20801120/4	284	270
20801140/1	17	15
21001141	0	0
21001142	0	0
21401100/1	0	0
21401100/2	523	493
21601060	0	0
21801080	0	0
21801100	0	0
Total	**16000**	**14446**

Note: These trips do not include the internal trips associated with the activity centers.

State Route 1 Land Use/Transportation Study

Technical Memorandum

I. Comparative Traffic Analysis for the Base and Build-Out-To-Plan Land Use Scenarios

Prepared For:
Delaware Department of Transportation

Prepared By:
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EXECUTIVE SUMMARY:

This report focuses on the comparative analysis of various transportation network performance measures for the base and build out to plan land use scenarios. The purpose of this analysis is to verify the effects of study area growth on transportation infrastructure, and to determine the adequacy of the existing roadway system.

The study area for the SR1 Land Use and Transportation Study is one of the growing areas in Sussex County and attracts heavy, seasonal, recreational traffic related to beach resorts and outlet malls. The base land use scenario, which represents the best-case scenario for future growth in the study area, assumes that there would be no further future growth in the study area beyond currently under construction development and currently proposed development and that these developments would be in place by 2007. The traffic volumes related to this scenario have been projected to the year 2025 to analyze the roadway system performance in future. The build out to plan land use scenario, which represents the worst-case scenario for future growth in the study area, assumes that all the vacant parcels and farmland would be developed as per their current zoning by 2025. It can be assumed that the actual growth within the study area by 2025 would be somewhere between the best-case and worst-case scenarios. It should be noted that both of these land use scenarios are based on existing zoning.

The comparative analysis indicates that the existing transportation network in the study area cannot handle even the best-case (base land use) scenario traffic by 2025. With the worst-case (build out to plan land use) scenario, the transportation network would be functionally obsolete. Both of these future year scenarios show highly deteriorated travel conditions within the study area with an excessive amount of delays and long traffic backups. For the 2025 build out to plan land use scenario, the network average speed would be close to 3 miles per hour during the peak hour on Saturdays in peak summer months, which is only slightly higher than the speed of walking. The major roadway corridors within the study area would be saturated by 2025 and traffic would shift to local roads. The excessive congestion and delays, on the entire roadway system, in turn, impacts other concerns like declined safety and poor quality of life. The analysis clearly indicates that transportation infrastructure improvements are highly essential to ensure the satisfactory flow of traffic within the study area by 2025.

1. INTRODUCTION:

The purpose of this report is to document the outcomes of the comparative traffic analyses, between the base land use scenario and build out to plan land use scenario, conducted for the SR1 Transportation/Land Use Study. The traffic analyses include comparison among the following transportation/land use networks:

1. 1998 network (existing conditions)
2. 2007 interim network (for base land use scenario)
3. 2025 network (for base land use scenario)
4. 2025 network (for build out to plan land use scenario)

Traffic analyses have been completed to compare measures of effectiveness (MOEs) for the following four dimensions:

1. Overall Approach: MOE comparisons to analyze the impacts of different land use scenarios and resulting traffic patterns on the overall study area.

2. Corridor Approach: MOE comparisons for the strategic roadway sections within the study area to analyze their performance under different land use scenarios and resulting traffic patterns.

3. Functional Classification Approach: Performance analysis based on highway functional classification to study the effect of different land use scenarios and resulting traffic patterns by type of roadway.

4. Signalized Intersection Approach: Performance analysis at the individual signalized intersection level to study the effects of different land use scenarios and resulting traffic on the operating conditions of signalized intersections.

2. MEASURES OF EFFECTIVENESS:

The following measures of effectiveness have been used in the comparative traffic analyses for overall and corridor approaches:

1. Vehicle Miles Traveled (VMT) - in miles
2. Vehicle Hours Traveled (VHT) - in hours
3. Average Speed - in miles per hour
4. Total Signal Delay - in hours
5. Signal Delay/Vehicle - in seconds
6. Queuing Penalty
7. Number of Unserved Vehicles

8. Performance Index
9. Fuel Consumption - in gallons
10. Fuel Economy - in miles per gallons
11. Toxic Emissions (CO, NOx, VOC) - in kgs

For the functional classification traffic analysis, VMT was used as the measure of effectiveness.

For signalized intersection approach, the following measures of effectiveness have been used to conduct the analysis:

1. Intersection Level of Service (LOS)
2. Intersection Signal Delay - in seconds
3. Intersection Capacity Utilization

3. OVERALL APPROACH FOR TRAFFIC ANALYSES: ENTIRE STUDY AREA PERFORMANCE

MOE comparison for the entire study area was undertaken to analyze the impacts of different land use scenarios and resulting traffic patterns on the study area as a whole. The entire study area includes 74 intersections, of which, 17 are signalized intersections. State Route 1 is the major arterial roadway, running north-south, with three lanes in each direction along most of its length in the study area, and dividing the study area into two parts. Of the 17 signalized intersections within the study area, 14 signals are on State Route 1.

Table 1 shows the comparative analysis of MOEs for the four networks under consideration. **Figure 1** compares change in the MOEs in the form of a bar chart. It can be seen that the rate of increase in VHT, within the study area, is much higher than the rate of increase in the VMT for both base and build out to plan land use scenarios in 2025. This indicates that there would be rapidly increasing congestion within the study area compared to existing conditions. The steep increase in the year 2025 signal delay per vehicle, compared to the existing conditions, also indicates a highly deteriorating traffic condition in the study area. The comparative MOEs clearly indicate that by 2025, under the base land use scenario, traffic operations on the existing transportation network would degenerate and the existing transportation network would not be able to sustain the 2025 traffic under the build out to plan scenario.

TABLE 1
Comparative Traffic Analysis for the Entire Study Area

MEASURES OF EFFECTIVENESS (MOEs) (Sat. AM Peak Hour)	NETWORKS			
	1998 (Existing)	2007 (Base Land Use – Interim Year)	2025 (Base Land Use)	2025 (Build Out to Plan Land Use)
Overall Network VMT[1]	40,904	52,465	65,726	91,381
Overall Network VHT[2]	2,940	5,352	9,256	27,832
Overall Network Average Speed[3]	13.91 mph	9.80 mph	7.10 mph	3.28 mph
Overall Network Total Signal Delay in Hours	2,001	4,145	7,749	25,692
Overall Network Signal Delay/ Vehicle in Seconds	46	74	112	279
Overall Network Queuing Penalty[4]	12,344	22,792	46,816	68,694
Overall Network Unserved Vehicles[5]	4,412	13,250	32,550	50,885
Overall Network Performance Index[6]	2523.6	5082.1	9559.1	28656.7

[1] VMT is the total distance traveled in miles, calculated by multiplying the traffic volume on the network links by link distances. It should be noted that the travel on the end links (exit links) of the network is not counted in the VMT.

[2] Total travel time in hours, which includes both travel time and delays.

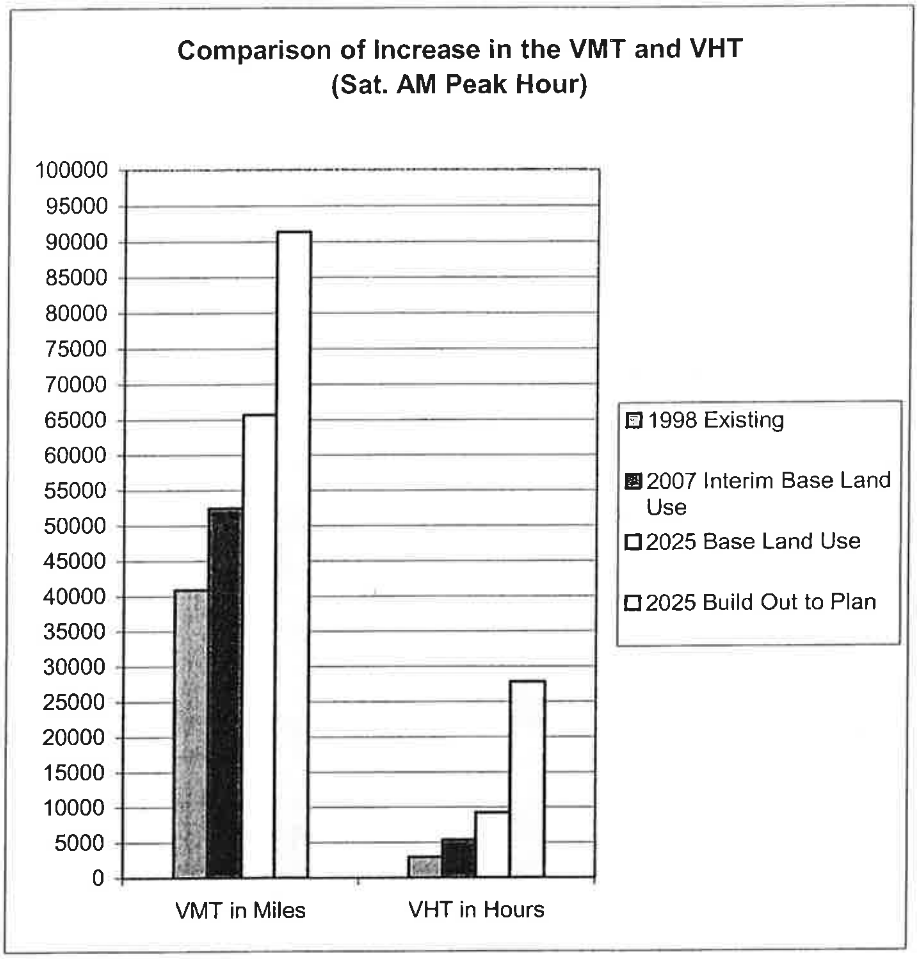
[3] Average speed is calculated by dividing link distance by travel time, including delays.

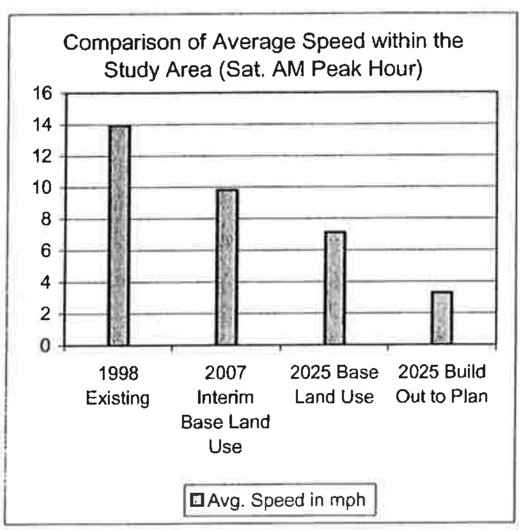
[4] Queuing penalty is the measure of the effects of queuing and blocking. It is calculated by multiplying the percent of blocking time by the number of vehicles affected. For example, if a link blocks up to the top of storage bay for 10% of the cycle and the link volume is 500 vehicles per hour, then queuing penalty will be 50. Thus, a lower queuing penalty indicates better network performance.

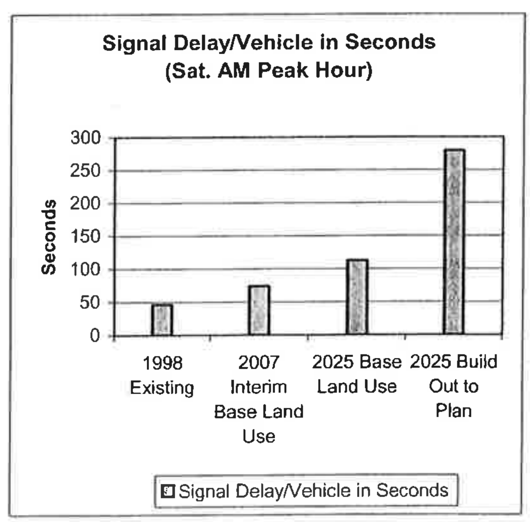
[5] The adjusted volume less the actuated capacity. For example, a value of 10 indicates that the volume exceeds the capacity by 10 vehicles per hour.

[6]A mathematical value derived from combined effects of delays, stops and queuing penalty. The lower the value of the performance index, the better the performance of the network.

FIGURE 1


Comparison of Increase in the VMT and VHT
(Sat. AM Peak Hour)
100000
95000
90000
85000
80000
75000
70000
65000
60000
55000
50000
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
VMT in Miles
VHT in Hours
1998 Existing
2007 Interim Base Land Use
2025 Base Land Use
2025 Build Out to Plan


Comparison of Average Speed within the Study Area (Sat. AM Peak Hour)
16
14
12
10
8
6
4
2
0
1998 Existing
2007 Interim Base Land Use
2025 Base Land Use
2025 Build Out to Plan
Avg. Speed in mph


Signal Delay/Vehicle in Seconds
(Sat. AM Peak Hour)
Seconds
300
250
200
150
100
50
0
1998 Existing
2007 Interim Base Land Use
2025 Base Land Use
2025 Build Out to Plan
Signal Delay/Vehicle in Seconds

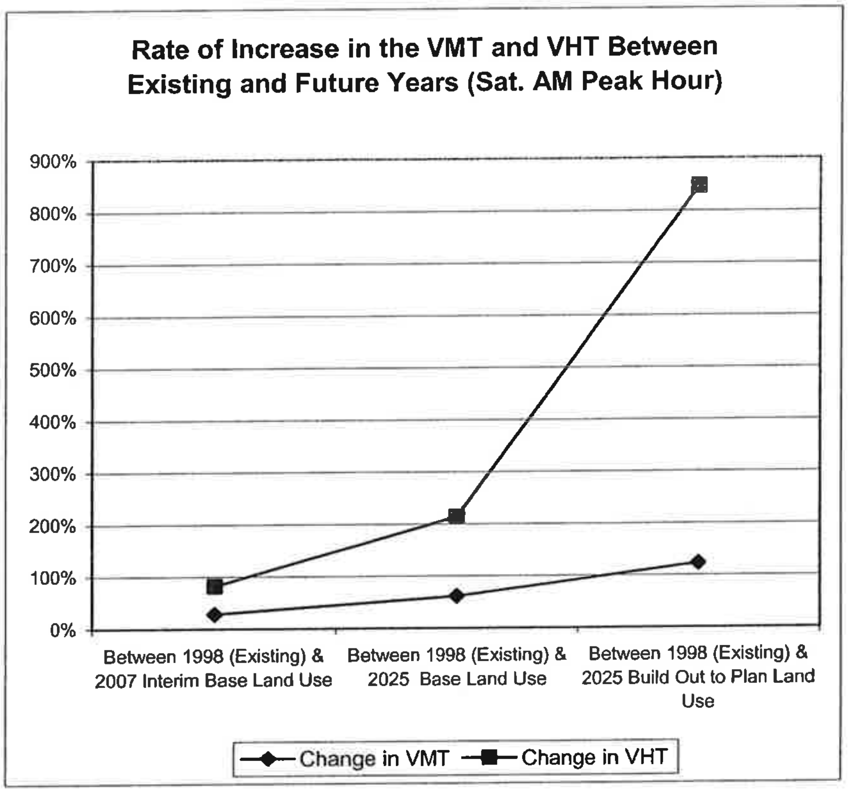
The percentile comparison of the changes in the MOEs, between existing and future years, is shown in **Table 2.** The excessively high percentile increase in VHT compared to VMT, the high increase in total signal delay and the number of unserved vehicles, the steep percentile decrease in average speed and the decrease in performance index, shows that the existing transportation network in the study area cannot sustain the traffic resulting from the 2025 build out to plan land use scenario. Even under the 2025 base land use scenario assumption, the existing transportation network would fail to operate throughout the entire study area. These findings indicate that if no transportation improvements occur in the study area, then the entire study area would suffer from extremely high levels of congestion, safety issues, and a highly deteriorated quality of life for residents.

TABLE 2
Comparative Percentile Analysis for the Entire Study Area

MEASURES OF EFFECTIVENESS (MOEs) (Sat. AM Peak Hour)	NETWORKS		
	Between 1998 (Existing) & 2007 (Base Land Use – Interim Year)	Between 1998 (Existing) & 2025 (Base Land Use)	Between 1998 (Existing) & 2025 (Build Out to Plan Land Use)
Change in Network VMT	+ 28%	+ 61%	+ 123%
Change in Network VHT	+ 82%	+ 214%	+ 846%
Change in Network Average Speed	- 42%	- 96%	- 324%
Change in Network Total Signal Delay	+ 107%	+ 287%	+ 1184%
Change Network Signal Delay/ Vehicle	+ 60%	+ 143%	+ 506%
Change in Network Queuing Penalty	+ 85%	+ 279%	+ 456%
Change in # of Unserved Vehicles	+ 200%	+ 638%	+ 1053%
Change in Network Performance Index	- 101%	- 279%	- 1036%

Figure 2 shows the graphical comparison between the rate of increase in the VMT and VHT between existing and future years. The greater the separation between VMT and VHT curves, the higher would be the level of congestion.

FIGURE 2


Rate of Increase in the VMT and VHT Between
Existing and Future Years (Sat. AM Peak Hour)
900%
800%
700%
600%
500%
400%
300%
200%
100%
0%
Between 1998 (Existing) & 2007 Interim Base Land Use
Between 1998 (Existing) & 2025 Base Land Use
Between 1998 (Existing) & 2025 Build Out to Plan Land Use
Change in VMT
Change in VHT

The environmental impacts in terms of air quality and fuel consumption of the 2025 base and build out to plan land use scenarios on the entire study area are shown in **Table 3** and **Figure 3**. It should be noted that the level of congestion is inversely proportionate to average speed, and directly proportionate to vehicle stops, delay, and fuel consumption. The higher the congestion level, the more the vehicle stops, delays and fuel consumption, and consequently average speed and fuel economy will decrease. Higher fuel consumption is, in turn, directly proportional to higher levels of toxic emissions. Thus, the following table demonstrates the severity of the environmental impacts in 2025, if no transportation improvements take place. It should be noted that the fuel economy figures, in miles per gallon, are very low as they are based only on the travel that occurs within the study area.

TABLE 3
COMPARATIVE ENVIRONMENTAL ANALYSIS
FOR THE ENTIRE STUDY AREA

MEASURES OF EFFECTIVENESS (MOEs) (Sat. AM Peak Hour)	NETWORKS			
	1998 (Existing)	2007 (Base Land Use – Interim Year)	2025 (Base Land Use)	2025 (Build Out to Plan Land Use)
Fuel Consumption for Overall Network in Gallons	3,631	6,134	10,086	26,988
Overall Network Fuel Economy (Miles per Gallon)	11.3	8.6	6.5	3.4
CO Emissions in Kg for the Entire Study Area	253.78	428.77	705.04	1886.46
NOx Emissions in Kg for the Entire Study Area	49.38	83.42	137.17	367.04
VOC Emissions in Kg for the Entire Study Area	58.82	99.37	163.40	437.21

Table 4 shows the percentile increase between existing and future years for the above MOEs. Fuel consumption is directly proportionate to toxic emissions and thus, the percentile change for fuel consumption, CO emissions, NOx emissions and VOC emissions is the same.

FIGURE 3

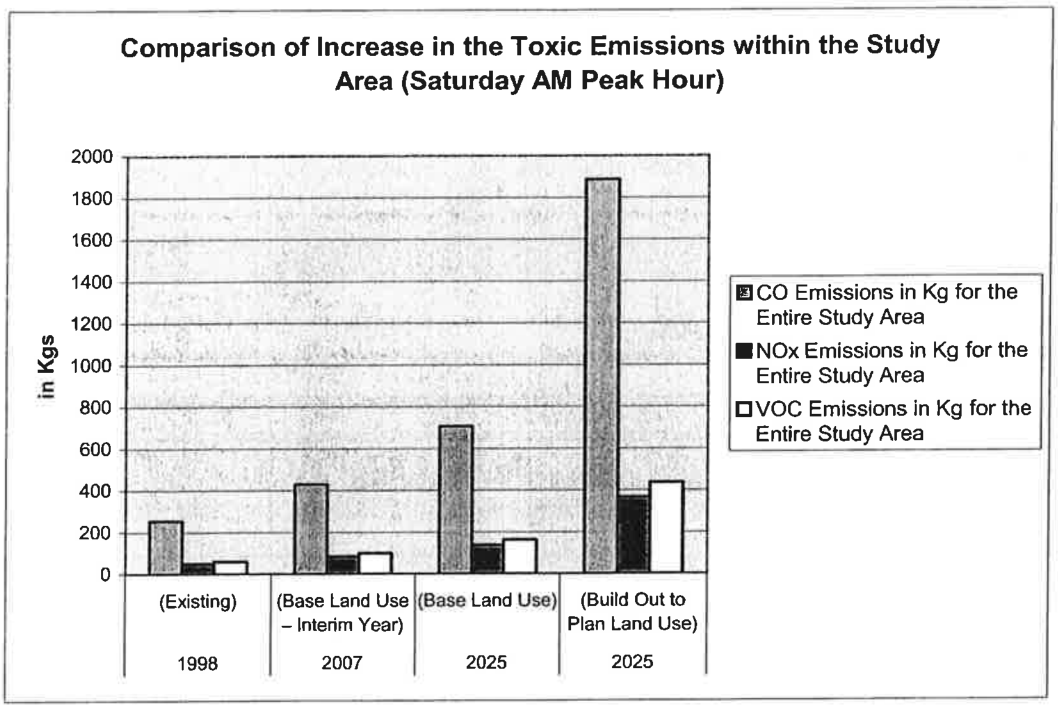

Comparison of Increase in the Toxic Emissions within the Study Area (Saturday AM Peak Hour)
in Kgs
2000
1800
1600
1400
1200
1000
800
600
400
200
0
(Existing)
1998
(Base Land Use – Interim Year)
2007
(Base Land Use)
2025
(Build Out to Plan Land Use)
2025
CO Emissions in Kg for the Entire Study Area
NOx Emissions in Kg for the Entire Study Area
VOC Emissions in Kg for the Entire Study Area

TABLE 4
Comparative Percentile Analysis on Environmental Impacts for the Entire Study Area

MEASURES OF EFFECTIVENESS (MOEs) (Sat. AM Peak Hour)	NETWORKS		
	Between 1998 (Existing) & 2007 (Base Land Use – Interim Year)	Between 1998 (Existing) & 2025 (Base Land Use)	Between 1998 (Existing) & 2025 (Build Out to Plan Land Use)
Change in Fuel Consumption for Overall Network in Gallons	+ 69%	+ 178%	+ 643%
Change in Overall Network Fuel Economy (Miles per Gallon)	- 31%	- 74%	- 232%
Change in CO Emissions in Kg for the Entire Study Area	+ 69%	+ 178%	+ 643%
Change in NOx Emissions in Kg for the Entire Study Area	+ 69%	+ 178%	+ 643%
Change in VOC Emissions in Kg for the Entire Study Area	+ 69%	+ 178%	+ 643%

Summary of the traffic and environmental analyses results for the entire study area:

- The existing transportation network in the study area is not capable of sustaining the 2025 base land use traffic volumes. The base land use scenario considers only currently proposed and under construction development in the study area. This scenario assumes that after this development occurs, there would be no new development in the study area after 2007. This is a best-case condition, which assumes the least amount of growth impact with the existing land use plan and existing zoning. The analyses results clearly indicate that the transportation network would fail by 2025 even for this least growth impact scenario.

- With the 2025 build out to plan land use scenario traffic volumes, the transportation network would be functionally obsolete if no improvements are done. With higher levels of congestion and higher travel times, the traffic in the study area would move at a speed close to 3 mile per hour, which is slightly higher than the speed of walking. This extreme level of congestion would hamper the economic growth of the area, and would have declining effects on the quality of life for residents. The build out to plan land use scenario considers the maximum possible growth under the existing land use plan and existing zoning.

- Apart from the travel time issue, there is a severe environmental impact on the study area if no transportation improvements are undertaken. In 2025, in the absence of any transportation improvements, the overall fuel consumption within the study are would rise by a minimum of 178 percent, and as high as 643 percent. These high increases in the fuel consumption, within the study area, would have proportionate environmental impacts, due to toxic emissions. This will adversely affect the quality of life in the study area.

4. CORRIDOR APPROACH FOR TRAFFIC ANALYSES: PERFORMANCE OF MAJOR ROADWAY CORRIDORS

The corridor approach focuses on impacts to individual roadway corridors within the study area to analyze the effect of various land use scenarios on corridor travel conditions. Similar to the entire network analyses, the corridor performance has been analyzed based on the comparative study of various MOEs. In addition, travel time analysis has been conducted for SR1 corridor to compare travel time from one point to another in the corridor. This travel time analysis shows the direct impact of a land use scenario on the SR1 corridor, in terms of delays. It should be noted that the Synchro model can perform travel time analysis between signalized intersections only.

The corridor analysis summarizes the MOEs for approaches on the arterial under consideration including turning lane groups. Side street approaches are not counted in this analysis. This has an impact on the results of the travel time analysis, as side street traffic volumes are not considered. The actual travel time for a given length of corridor may be higher than shown by the corridor travel time analysis. This analysis mainly focuses on the ratio of travel time required between any two points for various land use scenarios. The MOEs have been summarized by direction and totaled.

The following corridors within the study area have been analyzed under this approach:

A. State Route 1
B. State Route 18
C. State Route 24
D. Road 275

A. Analysis for State Route 1 Corridor

Table 5 shows the comparative traffic and environmental analyses results for the State Route 1 corridor.

TABLE 5
Comparative Traffic & Environmental Analysis for State Route 1 Corridor

MEASURES OF EFFECTIVENESS (MOEs) (Sat. AM Peak Hour)	NETWORKS			
	1998 (Existing)	2007 (Base Land Use – Interim Year)	2025 (Base Land Use)	2025 (Build Out to Plan Land Use)
Corridor VMT	28,304	36,372	46,272	53,027
Corridor VHT	1,569	2,813	5,105	6,395
Corridor Average Speed	18.04 mph	12.93 mph	9.06 mph	8.29 mph
Corridor Total Signal Delay in Hours	945	2,010	4,084	5,225
Corridor Signal Delay/ Vehicle in Seconds	30	50	81	92
Corridor Queuing Penalty	10,231	18,168	37,462	45,180
Corridor Unserved Vehicles	4,017	11,490	29,356	41,281
Corridor Performance Index	1347.0	2728.9	5490.7	6914.2
Fuel Consumption for Corridor in Gallons	2,206	3,699	6,251	7,626
Corridor Fuel Economy (Miles per Gallon)	12.8	9.8	7.4	7.0
CO Emissions in Kg for the Corridor	154.20	258.57	436.96	533.05
NOx Emissions in Kg for the Corridor	30.00	50.31	85.02	103.71
VOC Emissions in Kg for the Corridor	35.74	59.93	101.27	123.54

The percentile comparison of the changes in the MOEs between existing and future years for State Route 1 corridor is shown in **Table 6.**

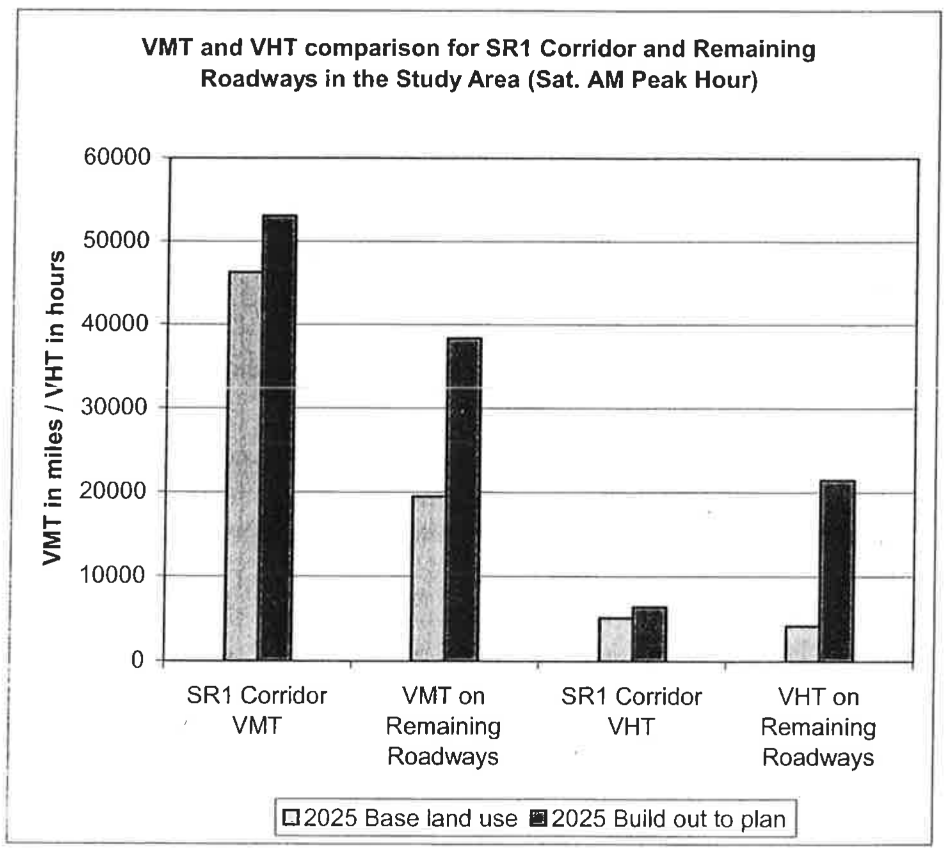
TABLE 6
Comparative Percentile Analysis for State Route 1 Corridor

MEASURES OF EFFECTIVENESS (MOEs) (Sat. AM Peak Hour)	NETWORKS		
	Between 1998 (Existing) & 2007 (Base Land Use – Interim Year)	Between 1998 (Existing) & 2025 (Base Land Use)	Between 1998 (Existing) & 2025 (Build Out to Plan Land Use)
Change in Corridor VMT	+ 29%	+ 63%	+ 87%
Change in Corridor VHT	+ 79%	+ 225%	+ 308%
Change in Corridor Average Speed	- 40%	- 99%	- 118%
Change in Corridor Total Signal Delay	+ 113%	+ 332%	+ 453%
Change Corridor Signal Delay/ Vehicle	+67%	+ 170%	+ 207%
Change in Corridor Queuing Penalty	+ 78%	+ 266%	+ 342%
Change in # of Unserved Vehicles	+ 186%	+ 630%	+ 928%
Change in Corridor Performance Index	- 102%	- 308%	- 413%
Change in Fuel Consumption for Corridor in Gallons	+ 68%	+ 183%	+ 246%
Change in Corridor Fuel Economy (Miles per Gallon)	- 31%	- 72%	- 83%
Change in CO Emissions in Kg for the Corridor	+ 68%	+ 183%	+ 246%
Change in NOx Emissions in Kg for the Corridor	+ 68%	+ 183%	+ 246%
Change in VOC Emissions in Kg for the Corridor	+ 68%	+ 183%	+ 246%

Interpretation of Results for the State Route 1 Corridor:

- Comparing the MOEs for State Route 1 (**Table 5**) with MOEs for the entire study area (**Table 1**), it can be clearly seen that by the year 2025, the SR1 corridor would be saturated. Under the 2025 base land use condition, the SR1 corridor carries 70% of the entire study area VMT. Under the 2025 build out to plan scenario, this percentage is reduced significantly to 58%. This indicates a shift in traffic volumes once the SR1 corridor becomes saturated. The excess traffic will load onto the remaining roadways in the study area, severely impacting the performance of these roadways. The deteriorating performance of the remaining roadways can be seen by VHT comparison. Under the 2025 base land use scenario, the remaining roadways carry 30% of the overall study area VMT and the associated VHT is 45% of the entire study area VHT. In the 2025 build out to plan scenario, remaining roadways carry 42% of the overall study area VMT (in increase of 12 %) and the associated VHT has increased sharply to 77% of the entire study area VHT (an increase of 32%). This indicates heavy delays on these roadways, and shows that the existing transportation network cannot handle the predicted volumes by 2025. **Figure 4** shows the VMT and VHT comparison for the SR1 corridor and all other roadways in the study area.

FIGURE 4



- The SR1 corridor will become saturated under the 2025 base land use scenario traffic volumes. Thereafter, any additional traffic related to the growth in the study area, from the build out scenario or from through traffic, will be diverted to the other roadways in the study area. **Table 7** shows the travel time analysis for the SR1 corridor between Five Points and Bay Vista Road for the various land use scenarios, while **Figure 5** represents the data graphically. **Figure 5** shows that the travel time curve rises sharply between the existing year and the 2025 base land use scenario, but then flattens showing almost no increase in the travel time, even though the study area growth is significant between the 2025 base land use scenario and the 2025 build out to plan scenario.

TABLE 7

SR1 Corridor Travel Time Analysis
Comparison between Various Land Use Scenarios

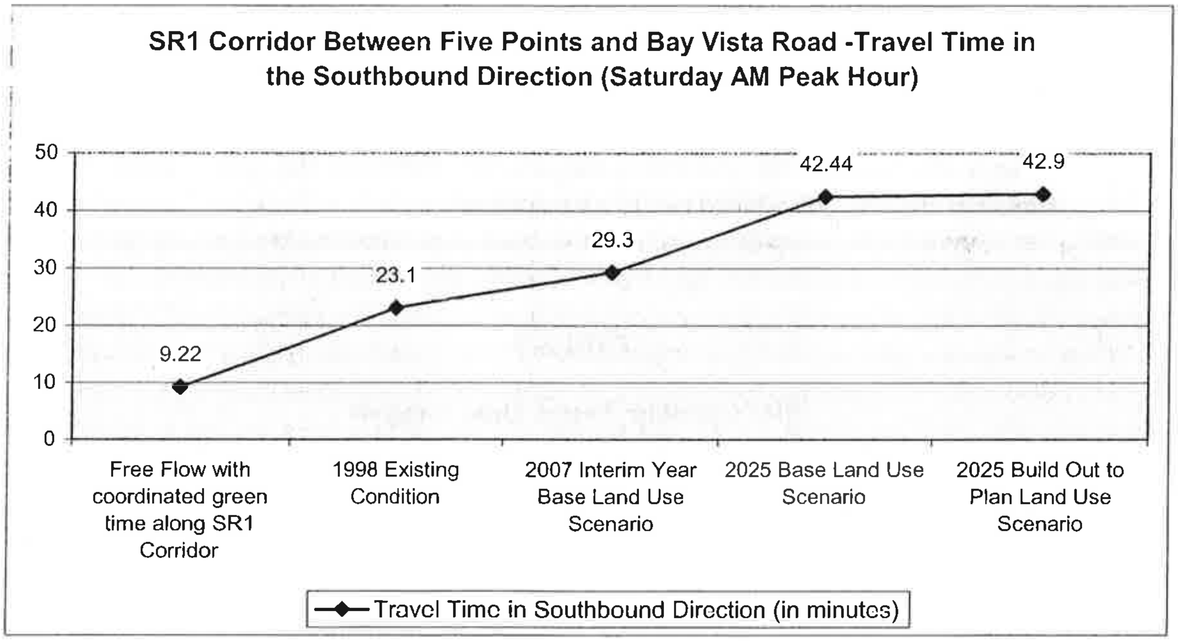
Corridor: SR1 between Five Points and Bay Vista Road.

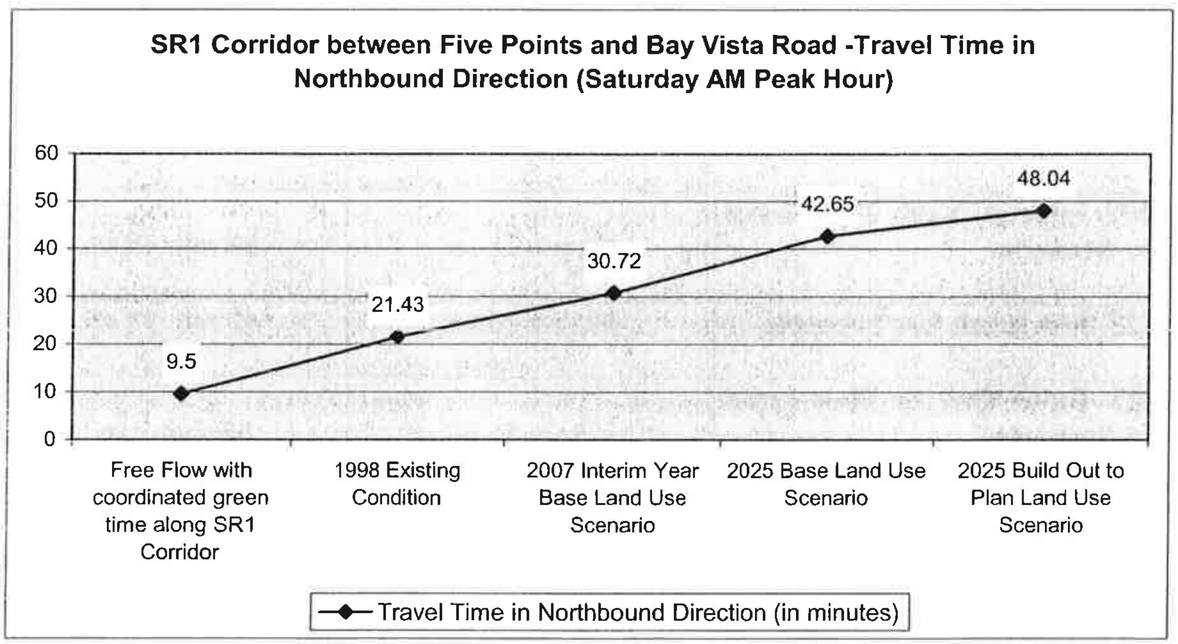
Corridor Length: 6.1 miles

Saturday AM Peak Hour	Travel Time in Southbound Direction	Travel Time in Northbound Direction
Free Flow with coordinated green time along SR1 Corridor	9 min 13 sec	9 min 30 sec
1998 Existing Condition	23 min 6 sec	21 min 26 sec
2007 Interim Year Base Land Use Scenario	29 min 18 sec	30 min 43 sec
2025 Base Land Use Scenario	42 min 26 sec	42 min 39 sec
2025 Build Out to Plan Land Use Scenario	42 min 54 sec	48 min 2 sec

Note: It should be noted that the Synchro model can not consider the traffic volumes from side streets in the conduct of a corridor analysis. Thus, the travel time indicated in the above table is based on SR1 corridor volumes only. The actual travel time will be higher than the corridor analysis travel time results. The main purpose of conducting the comparative travel time analysis is to determine the ratio of increase in the travel time between any two land use scenarios. For example, based on the travel time ratios displayed in the above table, if actual travel time between Five Points and Bay Vista Road under the 1998 existing condition is 45 minutes, then the 2025 base land use scenario travel time would be almost 1hour and 25 minutes.

FIGURE 5


SR1 Corridor Between Five Points and Bay Vista Road -Travel Time in the Southbound Direction (Saturday AM Peak Hour)
50
40
30
20
10
0
9.22
23.1
29.3
42.44
42.9
Free Flow with coordinated green time along SR1 Corridor
1998 Existing Condition
2007 Interim Year Base Land Use Scenario
2025 Base Land Use Scenario
2025 Build Out to Plan Land Use Scenario
Travel Time in Southbound Direction (in minutes)


SR1 Corridor between Five Points and Bay Vista Road -Travel Time in Northbound Direction (Saturday AM Peak Hour)
60
50
40
30
20
10
0
9.5
21.43
30.72
42.65
48.04
Free Flow with coordinated green time along SR1 Corridor
1998 Existing Condition
2007 Interim Year Base Land Use Scenario
2025 Base Land Use Scenario
2025 Build Out to Plan Land Use Scenario
Travel Time in Northbound Direction (in minutes)

B. Analysis for the State Route 18 Corridor

Table 8 shows the comparative traffic and environmental analyses results for the State Route 18 corridor.

TABLE 8
Comparative Traffic & Environmental Analysis for State Route 18 Corridor

MEASURES OF EFFECTIVENESS (MOEs) (Sat. AM Peak Hour)	NETWORKS			
	1998 (Existing)	2007 (Base Land Use – Interim Year)	2025 (Base Land Use)	2025 (Build Out to Plan Land Use)
Corridor VMT	1,797	2,137	2,810	3,602
Corridor VHT	61	111	200	311
Corridor Average Speed	29.46 mph	19.25 mph	14.05 mph	11.58 mph
Corridor Total Signal Delay in Hours	28	75	153	246
Corridor Signal Delay/ Vehicle in Seconds	19	44	67	78
Corridor Queuing Penalty	241	186	1,392	2,060
Corridor Unserved Vehicles	0	405	912	1,198
Corridor Performance Index	42.6	94.0	213.6	339.6
Fuel Consumption for Corridor in Gallons	119	190	307	468
Corridor Fuel Economy (Miles per Gallon)	15.1	11.3	9.1	7.7
CO Emissions in Kg for the Corridor	8.32	13.26	21.48	32.72
NOx Emissions in Kg for the Corridor	1.62	2.58	4.18	6.37
VOC Emissions in Kg for the Corridor	1.93	3.07	4.98	7.58

Interpretation of Results for the State Route 18 Corridor:

- The Route 18 corridor VMT for various land use scenarios are lower compared to that of SR1 corridor, because only a small section of Route 18 is within the study area.

- The comparison of corridor VMT and VHT indicates that the rate of increase in the VHT is much higher compared to the rate of increase in VMT for each land use scenario. This is a sign of increasing congestion along the corridor, which is also reflected by the sharply declining average speed for the corridor.

C. Analysis for the State Route 24 Corridor

Table 9 shows the comparative traffic and environmental analyses results for the State Route 24 corridor.

Interpretation of Results for the State Route 24 Corridor:

- The Route 24 corridor VMT for various land use scenarios is low, because only a small section of Route 24 is within the study area.

- The MOE comparisons for the corridor indicate that under the 2025 build out to plan scenario, VMT and VHT would be much higher when compared to the 2025 base scenario. This is because most of the land along the Route 24 corridor in the study area is vacant or farmland with agricultural/residential zoning under the 2025 base scenario. The 2025 build out to plan scenario assumes that these vacant and farmland parcels along Route 24 would be developed, creating significant local traffic. Due to this additional traffic, the operating conditions for this corridor would deteriorate, as reflected by MOEs such as total signal delay, signal delay per vehicle, queuing penalty, etc.

- Heavy congestion and delays along this corridor would result in lower average travel speed and fuel economy. Between the existing and 2025 build out to plan conditions, the average traffic speed would reduce from 36 mph to 11 mph and the fuel economy would decrease from 14.5 miles per gallon to 8 miles per gallon.

TABLE 9

Comparative Traffic & Environmental Analysis for State Route 24 Corridor

MEASURES OF EFFECTIVENESS (MOEs) (Sat. AM Peak Hour)	NETWORKS			
	1998 (Existing)	2007 (Base Land Use – Interim Year)	2025 (Base Land Use)	2025 (Build Out to Plan Land Use)
Corridor VMT	2288	2984	3,451	6,209
Corridor VHT	63	90	147	530
Corridor Average Speed	36.31 mph	33.15 mph	23.48 mph	11.71mph
Corridor Total Signal Delay in Hours	21	35	80	412
Corridor Signal Delay/ Vehicle in Seconds	16	21	40	111
Corridor Queuing Penalty	429	1,202	2,576	9,232
Corridor Unserved Vehicles	0	2	238	3,311
Corridor Performance Index	38.8	77.5	165.7	544.5
Fuel Consumption for Corridor in Gallons	119	168	239	774
Corridor Fuel Economy (Miles per Gallon)	19.2	17.8	14.5	8.0
CO Emissions in Kg for the Corridor	8.35	11.73	16.68	54.09
NOx Emissions in Kg for the Corridor	1.62	2.28	3.24	10.52
VOC Emissions in Kg for the Corridor	1.94	2.72	3.87	12.54

D. Analysis for the Road 275 Corridor (Plantations Road)

Table 10 shows the comparative traffic and environmental analyses results for the Road 275 corridor.

TABLE 10
Comparative Traffic & Environmental Analysis for State Road 275 Corridor

MEASURES OF EFFECTIVENESS (MOEs) (Sat. AM Peak Hour)	NETWORKS			
	1998 (Existing)	2007 (Base Land Use – Interim Year)	2025 (Base Land Use)	2025 (Build Out to Plan Land Use)
Corridor VMT	2,231	2,816	3,504	7,142
Corridor VHT	67	150	280	1,204
Corridor Average Speed	33.30 mph	18.77 mph	12.51mph	5.93 mph
Corridor Total Signal Delay in Hours	25	96	213	1,069
Corridor Signal Delay/ Vehicle in Seconds	20	59	110	258
Corridor Queuing Penalty	193	513	899	2,153
Corridor Unserved Vehicles	0	124	271	992
Corridor Performance Index	36.5	120.2	253.5	1178.9
Fuel Consumption for Corridor in Gallons	124	212	344	1,252
Corridor Fuel Economy (Miles per Gallon)	18.1	13.3	10.2	5.7
CO Emissions in Kg for the Corridor	8.63	14.81	24.02	87.48
NOx Emissions in Kg for the Corridor	1.68	2.88	4.67	17.02
VOC Emissions in Kg for the Corridor	2.00	3.43	5.57	20.28

Interpretation of Results for the Road 275 Corridor:

- The MOE comparisons for the corridor indicate that the 2025 build out to plan scenario VMT and VHT would be much higher than compared to the 2025 base scenario. Also, the rate of increase in VHT is very high, compared to rate of increase in VMT, which indicates that the corridor would be affected by heavy congestion problems. This is due to the fact that once the State Route 1 Corridor saturates, most of the traffic from SR 1 would divert to Road 275, as it is the only parallel roadway to SR1 within the study area. The results show that SR1 traffic, which has destinations within the study area, would divert to Road 275.

- The severe effect of congestion on Road 275 can be seen by comparing the average speed under existing conditions and the 2025 build out to plan scenario. The average speed would drop from 33.30 mph in 1998 to 5.93 mph in 2025.

- The effects of the 2025 build out to plan scenario traffic volumes on the existing roadway network show that once the other principal arterials (SR1, SR18 etc.) within the study area become saturated, traffic will divert to the local roadways, deteriorating their performance severely. The performance of local roadways would decline sharply because there are no other roads in the study area to reduce the traffic load on the local roads. Both the 2025 base land use scenario and 2025 build out to plan scenario MOEs clearly indicate the need for additional roadway links, within the study area, to move the traffic effectively.

5. FUNCTIONAL CLASSIFICATION APPROACH FOR TRAFFIC ANALYSES: PERFORMANCE OF ROADWAYS BY FUNCTIONAL CLASS

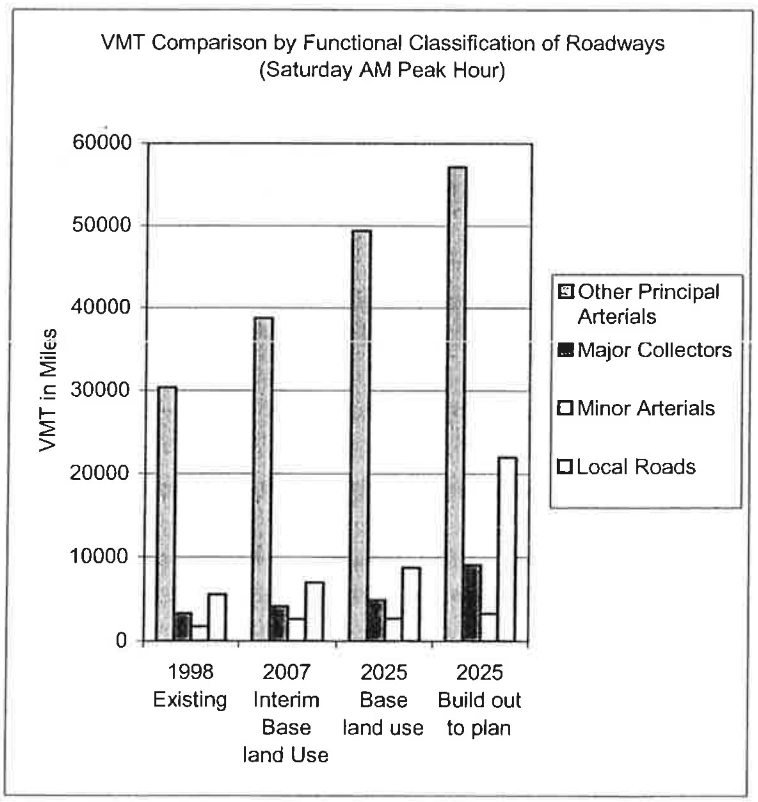
The functional classification approach summarizes the VMT results for all the roadways within the study area by type of roadway. This approach is useful to analyze which roadway classes would be affected the most, due to the traffic growth related to various land use scenarios.

Table 11 and **Figure 6** show the VMT comparisons for the different networks under consideration. It can be seen that the rate of increase in the VMT on local roadways is the highest for future year 2025, among all the functional classes. In the 2025 build out to plan scenario, local traffic originating within the study area would be very high. The VMT comparison reflects that, under the 2025 build out to plan scenario, the miles traveled on local roadways would be more than two thirds of the miles traveled on other principal arterials under 1998 existing conditions. It should be noted that the capacity of local roadways is much less than that of other principal arterials. This indicates that the existing transportation network would not be able to handle future traffic within the study area under these scenarios.

TABLE 11
Comparative VMT Analysis by Functional Classification

Functional Class (Sat. AM Peak Hour)	NETWORKS			
	1998 (Existing)	2007 (Base Land Use – Interim Year)	2025 (Base Land Use)	2025 (Build Out to Plan Land Use)
Other Principal Arterials (SR1, SR18 west of SR1, Kings Highway)				
VMT	30,357	38,758	49,370	57,127
Major Collectors (SR18 east of SR1, SR 23, SR 24)				
VMT	3,266	4,115	4,939	9,037
Minor Arterials (SR1A, Road 268 from SR1 to Dartmouth Road)				
VMT	1,744	2,626	2,687	3,270
Local Roads (Remaining roadways in the study area)				
VMT	5,537	6,966	8,730	21,947

FIGURE 6



6. SIGNALIZED INTERSECTION APPROACH FOR TRAFFIC ANALYSES: PERFORMANCE OF SIGNALIZED INTERSECTIONS WITHIN THE STUDY AREA

There are 17 signalized intersections within the study area, of which 14 are on SR1. This traffic analysis approach focuses on the effects of future traffic, related to the base and build out to plan land use scenarios, on the performance of individual signalized intersections. The level of service for a signalized intersection is based on the average control delay a vehicle experiences at a particular intersection. The specific levels of service for a signalized intersection relate to following average control delay:

Level of Service	Average Control Delay per Vehicle (in sec.)
A (Excellent -Free flow)	<= 10
B (Very Good -Minor adjustments)	>10 and <=20
C (Good -Stable Flow of traffic)	>20 and <=35
D (Satisfactory flow -Occasional delays)	>35 and <=55
E (Capacity flow- Regular delays)	>55 and <=80
F (Failing- Significant delays and queuing)	>80

The previous traffic analysis report prepared for the SR1 Land Use Transportation Study, which compared the 1998 existing and 2007 (interim) base land use scenarios, showed detailed signalized intersection comparative analysis for the two networks. It displayed LOS for individual intersections as well as for individual approaches at each intersection, and noted the change in traffic volumes, delays and queue lengths for each intersection approach.

The future year land use scenario traffic volumes (2025 base land use and 2025 build out to plan land use) indicate that almost all the signalized intersections in the study area have a failing LOS. Thus, analyzing the change in LOS in detail is unnecessary. Hence, this report notes only the intersection LOS, capacity utilization and total signal delay at each signalized intersection for various land use scenarios, to facilitate the comparison of signalized intersection performance. **Table 12** shows the overall summary, whereas **Table 13** shows the performance comparison for each intersection.

TABLE 12
Summary of the Signalized Intersection Performance

Level of Service (Sat. AM Peak Hour)	# of Signalized Intersections			
	1998 (Existing)	2007 (Base Land Use – Interim Year)	2025 (Base Land Use)	2025 (Build Out to Plan Land Use)
Acceptable (A, B, C or D)	13	9	2	0
At Capacity or Failing (E or F)	4	8	15	17

TABLE 13
Comparative Signalized Intersection Performance Analysis

Signalized Intersection (Sat. AM Peak Hour)	NETWORKS			
	1998 (Existing)	2007 (Base Land Use – Interim Year)	2025 (Base Land Use)	2025 (Build Out to Plan Land Use)
State Route 18 & Road 285B				
Intersection LOS	D	F	F	F
Int. Capacity Utilization	80.9%	94.8%	124.0%	135.2%
Intersection Signal Delay	36.2 sec.	84.6 sec.	124.9 sec.	117.9 sec.
State Route 18 & State Route 1				
Intersection LOS	F	F	F	F
Int. Capacity Utilization	106.3%	135.0%	177.6%	211.3%
Intersection Signal Delay	156.8 sec.	201.4 sec.	237.9 sec.	238.4 sec.
State Route 1 & Westcoats Road				
Intersection LOS	B	D	E	F
Int. Capacity Utilization	78.6%	99.6%	123.9%	151.5%
Intersection Signal Delay	13.1 sec.	42.3 sec.	77.7 sec.	118.7 sec.
State Route 1 & Dartmouth Drive				
Intersection LOS	F	F	F	F
Int. Capacity Utilization	108.4%	113.1%	136.9%	180.2%
Intersection Signal Delay	103.8 sec.	127.9 sec.	202.5 sec.	214.8
State Route 1 & Road 283				
Intersection LOS	C	C	E	F
Int. Capacity Utilization	90.0%	88.4%	110.4%	137.3%
Intersection Signal Delay	25.0 sec.	22.9 sec.	75.2 sec.	141.4 sec.
State Route 1 & Midway Shopping				
Intersection LOS	C	D	F	F
Int. Capacity Utilization	91.8%	94.2%	117.9%	117.9%
Intersection Signal Delay	24.4 sec.	36.8 sec.	123.1 sec.	101.0 sec.
State Route 1 & State Route 24				
Intersection LOS	C	D	F	F
Int. Capacity Utilization	78.9%	100.5%	130.8%	153.2%
Intersection Signal Delay	25.6 sec.	37.0 sec.	93.9 sec.	119.6 sec.
State Route 1 & Rehoboth Mall Road				
Intersection LOS	A	A	C	E
Int. Capacity Utilization	61.4%	67.7%	98.0%	108.4%
Intersection Signal Delay	0.7 sec.	0.8 sec.	21.9 sec.	56.2 sec.
State Route 1 & Road 274				
Intersection LOS	C	D	F	F
Int. Capacity Utilization	82.6%	109.1%	131.7%	171.2%
Intersection Signal Delay	33.5 sec.	50.6 sec.	116.4 sec.	126.0 sec.
State Route 1 & Munchy Branch Road				
Intersection LOS	C	E	F	F
Int. Capacity Utilization	100.4%	128.1%	149.6%	155.6%
Intersection Signal Delay	32.0 sec.	66.5 sec.	120.1 sec.	131.1 sec.

State Route 1 & Camelot Drive				
Intersection LOS	C	F	F	F
Int. Capacity Utilization	82.0%	175.7%	212.0%	233.2%
Intersection Signal Delay	22.8 sec.	133.1 sec.	173.9 sec.	186.9 sec.
State Route 1 & K-Mart Access				
Intersection LOS	B	D	F	F
Int. Capacity Utilization	84.4%	106.4%	123.7%	136.6%
Intersection Signal Delay	16.1 sec.	37.5 sec.	84.0 sec.	122.0 sec.
State Route 1 & Road 273				
Intersection LOS	B	D	F	F
Int. Capacity Utilization	82.0%	102.7%	121.3%	142.1%
Intersection Signal Delay	18.1 sec.	42.5 sec.	84.1 sec.	108.5 sec.
State Route 1 & Rehoboth Ave.				
Intersection LOS	F	F	F	F
Int. Capacity Utilization	106.5%	141.8%	164.9%	189.5%
Intersection Signal Delay	217.0 sec.	275.1 sec	288.2 sec.	298.1 sec.
State Route 1 & Bay Vista Road				
Intersection LOS	F	F	F	F
Int. Capacity Utilization	74.4%	85.6%	99.7%	126.7%
Intersection Signal Delay	93.7 sec.	154.2 sec.	202.9 sec.	261.4 sec.
State Route 24 & Rehoboth Mall				
Intersection LOS	A	A	A	F
Int. Capacity Utilization	54.3%	85.2%	101.9%	205.7%
Intersection Signal Delay	5.4 sec.	4.8 sec.	6.8 sec.	172.3 sec.
State Route 24 & Road 275				
Intersection LOS	C	E	F	F
Int. Capacity Utilization	80.2%	97.1%	120.0%	188.6%
Intersection Signal Delay	30.2 sec.	64.1 sec.	96.1 sec.	221.5 sec.

Interpretation of the Signalized Intersection Results:

- The MOEs for signalized intersections indicate that the existing roadway infrastructure, within the study area, is not capable of handling even the 2025 base land use scenario volumes. The 2025 base land use scenario is the best-case scenario, and any likely future traffic volumes in 2025 would be higher than the traffic volumes generated under the 2025 base land use scenario. This shows a crucial need for roadway infrastructure improvements within the study area.

- Optimizing the network signal timings, based on future year traffic volumes, would also help to slightly improve the signalized intersection performance within the study area. However, it should be noted that optimizing the signal timings alone would not ameliorate future conditions, and infrastructure improvements would be essential. Optimizing the network signal timings would slightly decrease intersection delays and queue lengths, but the intersections would still operate under a failing level of service.

State Route 1 Land Use/Transportation Study

Technical Memorandum

J. Comparative Traffic Analysis for the Build-Out-To Plan and Expanded Development District Land Use Scenarios

Prepared For:
Delaware Department of Transportation

Prepared By:
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I. Introduction:

The purpose of this memorandum is to document the outcome of the comparative traffic analyses conducted between the Build Out to Plan Land Use Scenario and the Expanded Development District Scenario for the SR1 Transportation/Land Use Study area. The traffic analyses have been conducted to include comparison among the following transportation/land use networks:

1. 2025 build out to plan land use scenario network
2. 2025 expanded development district scenario network

Changes in the Expanded Development District Scenario compared to the Build Out to Plan Land Use Scenario:

- The development district boundary line shifts to the south of Rd. 275 between SR23 and Rd.274. This results in an increased development density (from 2 DUs per acre to 4 DUs per acre) for some vacant residential/farmland parcels within this newly added development district area.

- Development density for some of the environmentally sensitive vacant land parcels, located to the east of Rd. 274 and also to the east of SR24, has been reduced to 2DUs per acre from 4 DUs per acre.

- Development density for all the other parcels within the study area remains the same, i.e. development density for parcels within the development district is 4 DUs per acre and for those outside the development district is 2 DUs per acre.

Corresponding changes in the trip generation/distribution for the Expanded Development District Scenario compared to the Build Out to Plan Land Use Scenario:

- The net result (of increased development density to the south of Rd. 275 and decreased development density for some environmentally sensitive land parcels along SR24 and Rd.274) in terms of trip generation is 213 additional trips in the SR1 study area for the Expanded Development District Scenario compared to the Build Out to Plan Land Use Scenario.

- Additional trips slightly change the trip distribution pattern and trip length characteristics for the Expanded Development District Scenario.

- Changes in the measures of effectiveness (MOEs) have been compared in the subsequent sections of this report.

II. Overall Study Area Wide Analysis

Table 1 shows the overall study area wide measures of effectiveness for the two land use scenarios under consideration.

TABLE 1
Comparative Traffic Analysis for the Entire Study Area

MEASURES OF EFFECTIVENESS (MOEs)	NETWORKS			
	2025 (Build Out to Plan Land Use)	**2025 (Expanded Development District)**	**Change**	**% Change**
Overall Network VMT[1]	91,381	92,828	+ 1,447	+ 1.6%
Overall Network VHT[2]	27,832	28,455	+ 623	+ 2.2%
Overall Network Average Speed[3]	3.28 mph	3.26 mph	- 0.02 mph	- 0.6%
Overall Network Total Signal Delay in Hours	25,692	26,276	+ 584	+ 2.3%
Overall Network Signal Delay/ Vehicle in Seconds	279	281	+ 2	+ 0.7%
Overall Network Queuing Penalty[4]	68,694	71,795	+ 3,101	+ 4.5%
Overall Network Unserved Vehicles[5]	50,885	53,829	+ 2,944	+ 5.8%
Overall Network Performance Index[6]	28,656.7	28,687.5	(-) 30.8	(-) 0.1%

[1] VMT is the total distance traveled in miles, calculated by multiplying the traffic volume on the network links by link distances. It should be noted that the travel on the end links (exit links) of the network is not counted in the VMT.

[2] Total travel time in hours, which includes both travel time and delays.

[3] Average speed is calculated by dividing link distance by travel time, including delays.

[4] Queuing penalty is the measure of the affects of queuing and blocking. It is calculated by multiplying the percent of blocking time by the number of vehicles affected. For example, if a link blocks up to the top of storage bay for 10% of the cycle and the link volume is 500 vehicles per hour, then queuing penalty will be 50. The lower the queuing penalty the better the network performance.

[5] The adjusted volume less the actuated capacity. For example, a value of 10 indicates that the volume exceeds the capacity by 10 vehicles per hour.

[6]A mathematical value derived from combined effects of delays, stops and queuing penalty. The lower the value of the performance index the better is the performance of the network.

Interpretation of the Results:

- The comparison of measures of effectiveness between the two scenarios indicates a minimal change. This minimal change is mainly because additional trips in the Expanded Development District Scenario are only 0.6% more (only 213 more trips) than that of for the Build Out to Plan Scenario.

- A higher percent change in the overall network queuing penalty and overall network unserved vehicles compared to the rest of the MOEs indicate that even a small change in network VMT reflect higher impacts on the network. This is because the Build Out to Plan Scenario network has already been saturated with excessive traffic volumes.

The environmental impacts of the 2025 build out to plan land use and 2025 expanded development district scenarios on the entire study area are shown in **Table 2**.

TABLE 2
COMPARATIVE ENVIRONMENTAL ANALYSIS FOR THE ENTIRE STUDY AREA

MEASURES OF EFFECTIVENESS (MOEs)	NETWORKS			
	2025 (Build Out to Plan Land Use)	2025 (Expanded Development District)	Change	% Change
Fuel Consumption for Overall Network in Gallons	26,988	26,136	- 852	- 3.1%
Overall Network Fuel Economy (Miles per Gallon)	3.4	3.6	+ 0.2	+ 5.6%
CO Emissions in Kg for the Entire Study Area	1886.46	1826.90	- 59.56	- 3.1%
NOx Emissions in Kg for the Entire Study Area	367.04	355.45	- 11.59	- 3.1%
VOC Emissions in Kg for the Entire Study Area	437.21	423.40	- 13.81	- 3.1%

Interpretation of the Results:

- Although VMT and VHT for the Expanded Development District Scenario are higher than that of the Build Out to Plan Scenario, the fuel consumption, fuel economy and emissions numbers for the Expanded Development District Scenario are slightly better than that of the Build Out to Plan Scenario. This may have occurred due to likely change in the trip lengths and trip distribution for the Expanded Development District Scenario. For example, from a fuel consumption and emissions point of view, a few longer trips offer better results than many short distance trips even if the overall miles traveled remain the same.

III. Corridor Analysis

Since the additional development in the Expanded Development District Scenario is mainly along the Rd 275, the comparative corridor analysis focuses on the Rd. 275 Corridor as shown in **Table 3**. A corridor analysis was also conducted for the SR1 Corridor (see **Table 4**).

A. Road 275 Corridor:

TABLE 3
Comparative Traffic Analysis for the Road 275 Corridor

MEASURES OF EFFECTIVENESS (MOEs)	NETWORKS			
	2025 (Build Out to Plan Land Use)	**2025 (Expanded Development District)**	**Change**	**% Change**
Corridor VMT	7,142	7,363	+ 221	+ 3.1%
Corridor VHT	1,204	1,352	+ 148	+ 12.3%
Corridor Average Speed	5.93 mph	5.45 mph	- 0.48 mph	- 8.1%
Corridor Total Signal Delay in Hours	1,069	1,212	+ 143	+ 13.4%
Corridor Signal Delay/ Vehicle in Seconds	258	278	+ 20	+ 7.7%
Corridor Queuing Penalty	2,153	2,276	+ 123	+ 5.7%
Corridor Unserved Vehicles	992	1,082	+ 90	+ 9.1%
Corridor Performance Index	1178.9	1371.5	(-) 192.6	(-) 16.33%

Interpretation of Analysis results for Road 275 Corridor:

- The MOE comparisons for the corridor indicate that even with a small increase in the corridor VMT, the overall impact on the performance of the corridor is comparatively high as reflected by the change in the corridor VHT, total signal delay and corridor performance index percentages.

B. SR1 Corridor:

TABLE 3
Comparative Traffic Analysis for the SR1 Corridor

MEASURES OF EFFECTIVENESS (MOEs)	NETWORKS			
	2025 (Build Out to Plan Land Use)	**2025 (Expanded Development District)**	**Change**	**% Change**
Corridor VMT	53,027	53,526	+ 499	+ 0.9%
Corridor VHT	6,395	6,575	+ 180	+ 2.8%
Corridor Average Speed	8.29 mph	8.14 mph	- 0.15 mph	- 1.8%
Corridor Total Signal Delay in Hours	5,225	5,394	169	+ 3.2%
Corridor Signal Delay/ Vehicle in Seconds	92	93	+ 1	+ 0.9%
Corridor Queuing Penalty	45,180	46,998	+ 1,818	+ 3.9%
Corridor Unserved Vehicles	41,281	42,981	+ 700	+ 1.6%
Corridor Performance Index	6914.2	7144.8	(-) 230.6	(-) 3.33%

Interpretation of Analysis results for the SR1 Corridor:

- Although the percentile change in the MOEs for the SR1 Corridor indicates that the impact of the additional development in the Expanded Development District Scenario is a relatively small change on the SR1 Corridor, it is a significant impact in terms of actual change in MOEs. The absolute change in the SR1 Corridor VMT is higher as compared to that of the Rd. 275 Corridor VMT due to the increased development in the Expanded District Scenario. This indicates that although the additional trips are originated along the Rd. 275 Corridor, they travel major portion of this trip length on SR1.

IV. Performance of the Signalized Intersection of Rd. 275 and SR24:

TABLE 4
Comparative Signalized Intersection Performance Analysis

Signalized Intersection	NETWORKS	
	2025 (Build Out to Plan Land Use)	**2025 (Expanded Development District)**
State Route 24 & Road 275		
Intersection LOS	F	F
Int. Capacity Utilization	188.6%	189.0%
Intersection Signal Delay	221.5 sec.	226.7 sec.

Interpretation of the Signalized Intersection Analysis Results:

- Although there is additional development along the Rd.275 corridor in the expanded development district scenario, the performance of the signalized intersection at SR24 and Rd.275 is deteriorating only by a minimal proportion. This is mainly because the increase in the traffic volumes along Rd.275 approaches is partially compensated by the decrease in the traffic volumes along SR 24 approaches at this intersection. The SR24 traffic volumes would decrease in the expanded development district scenario due to reduction in the development potential for the environmentally sensitive land parcels on the east side of SR24, south of the signalized intersection under consideration.

State Route 1 Land Use/Transportation Study

Technical Memorandum

K. Comparative Traffic Analysis for All the Land Use Scenarios

Prepared For:
Delaware Department of Transportation

DelDOT

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Introduction:

The four Land Use Scenarios under consideration for the future year 2025 represent various growth levels within the study area and the related transportation impacts. The amount of growth is in the increasing order from the Base Land Use Scenario, to the Build Out to Plan Land Use Scenario and finally to the Expanded Development District Scenario and Activity Center-Village Scenario. The growth or overall development potential for the expanded development district scenario and the activity center/village scenario is same. The only difference is that the latter has development potential rearranged in a compact, mixed-use manner to promote more internal trips, to foster trips by bicycling, walking and transit and to reduce the necessity for local residents to access the SR1 corridor for their day-to-day essential commercial/retail needs.

The comparative analysis has been conducted in a similar manner as that of the previous analyses. The interpretation of the analysis results mainly discusses the comparison between the expanded development district scenario and the activity center/village scenario as the comparison of the remaining scenarios has already been presented in previous analysis reports.

It should be noted that the study area traffic volumes in 2025, related to the each of the four future year land use scenarios, are beyond the capabilities of the existing transportation network in the study area. Hence, the main purpose of this analysis is to perform a comparison between measures of effectiveness for each of the scenarios.

Part I: Entire Study Area Analysis

TABLE 1
Entire Study Area Comparative Traffic Analysis for All the Land Use Scenarios Considered

MEASURES OF EFFECTIVENESS (MOEs) (Sat. AM Peak Hour)	NETWORKS					
	1998 (Existing)	2007 (Base Land Use – Interim Year)	2025 (Base Land Use)	2025 (Build Out to Plan Land Use)	2025 (Expanded Development District)	2025 (Activity Centers/Villages)
Overall Network VMT	40,904	52,465	65,726	91,381	92,828	77,067
Overall Network VHT	2,940	5,352	9,256	27,832	28,455	16,031
Overall Network Average Speed	13.91 mph	9.80 mph	7.10 mph	3.28 mph	3.26 mph	4.80 mph
Overall Network Total Signal Delay in Hours	2,001	4,145	7,749	25,692	26,276	14,269
Overall Network Signal Delay/ Vehicle in Seconds	46	74	112	279	281	182
Overall Network Queuing Penalty	12,344	22,792	46,816	68,694	71,795	63,331
Overall Network Unserved Vehicles	4,412	13,250	32,550	50,885	53,829	42,944
Overall Network Performance Index	2523.6	5082.1	9559.1	28656.7	28687.5	16703.8

FIGURE 1

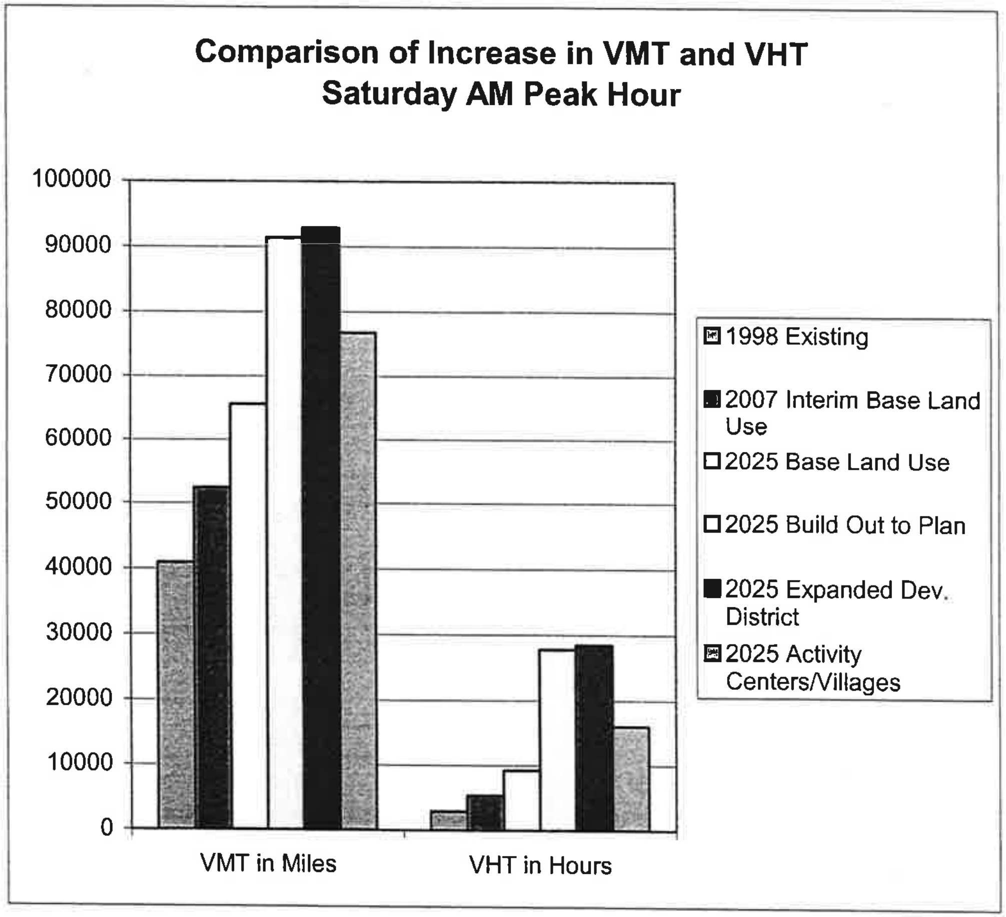
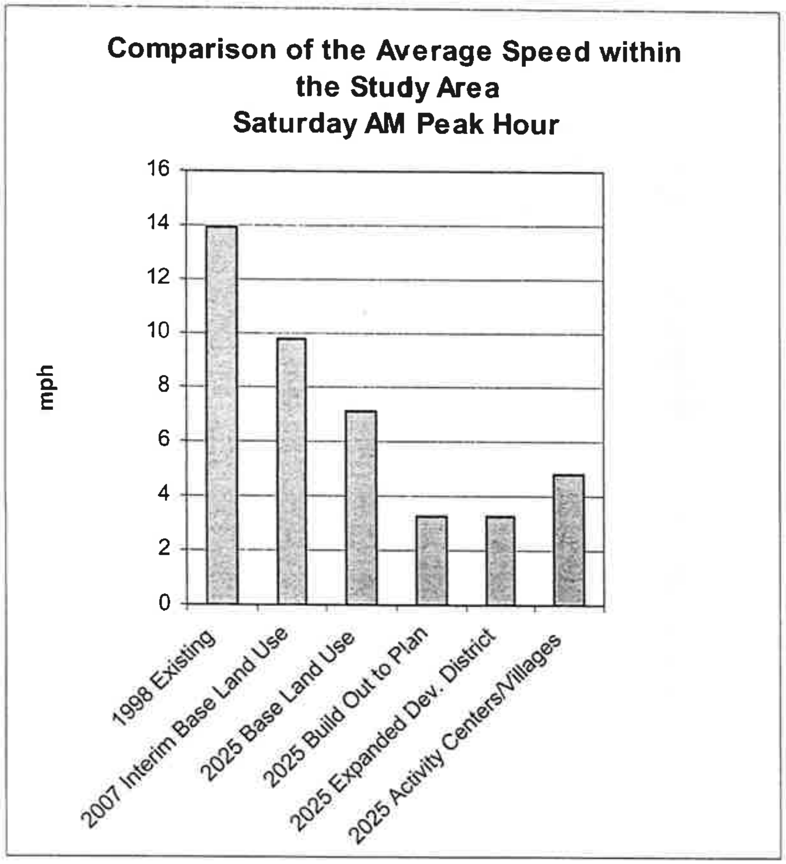

Comparison of Increase in VMT and VHT
Saturday AM Peak Hour
100000
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
VMT in Miles
VHT in Hours
1998 Existing
2007 Interim Base Land Use
2025 Base Land Use
2025 Build Out to Plan
2025 Expanded Dev. District
2025 Activity Centers/Villages

FIGURE 2


Comparison of the Average Speed within the Study Area
Saturday AM Peak Hour
mph
16
14
12
10
8
6
4
2
0
1998 Existing
2007 Interim Base Land Use
2025 Base Land Use
2025 Build Out to Plan
2025 Expanded Dev. District
2025 Activity Centers/Villages

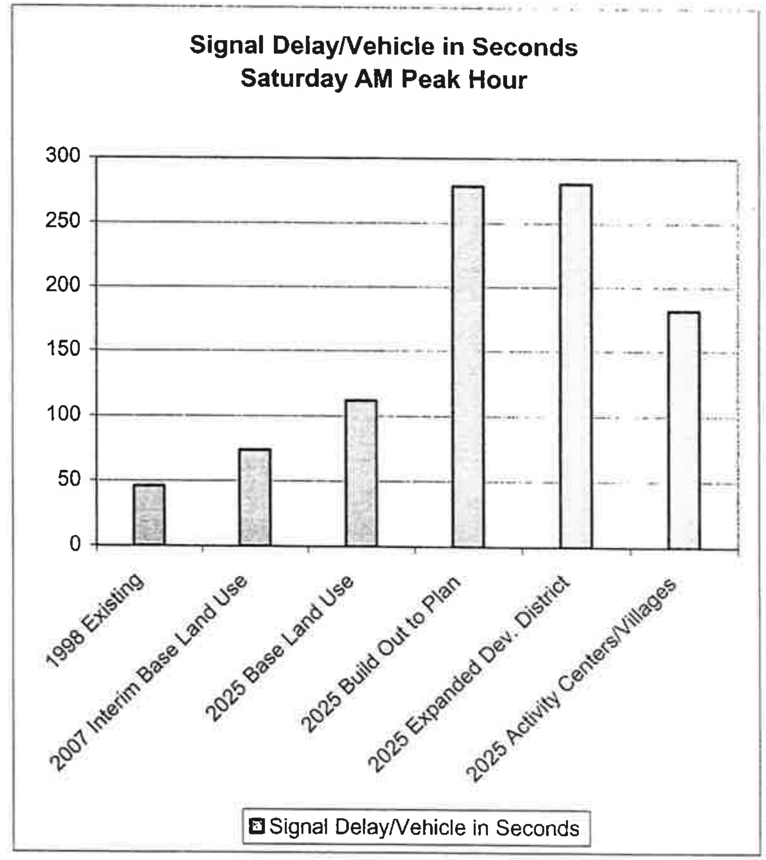

Signal Delay/Vehicle in Seconds
Saturday AM Peak Hour
300
250
200
150
100
50
0
1998 Existing
2007 Interim Base Land Use
2025 Base Land Use
2025 Build Out to Plan
2025 Expanded Dev. District
2025 Activity Centers/Villages
Signal Delay/Vehicle in Seconds

TABLE 2
Entire Study Area Comparative Percentile Analysis for All the Land Use Scenarios Considered

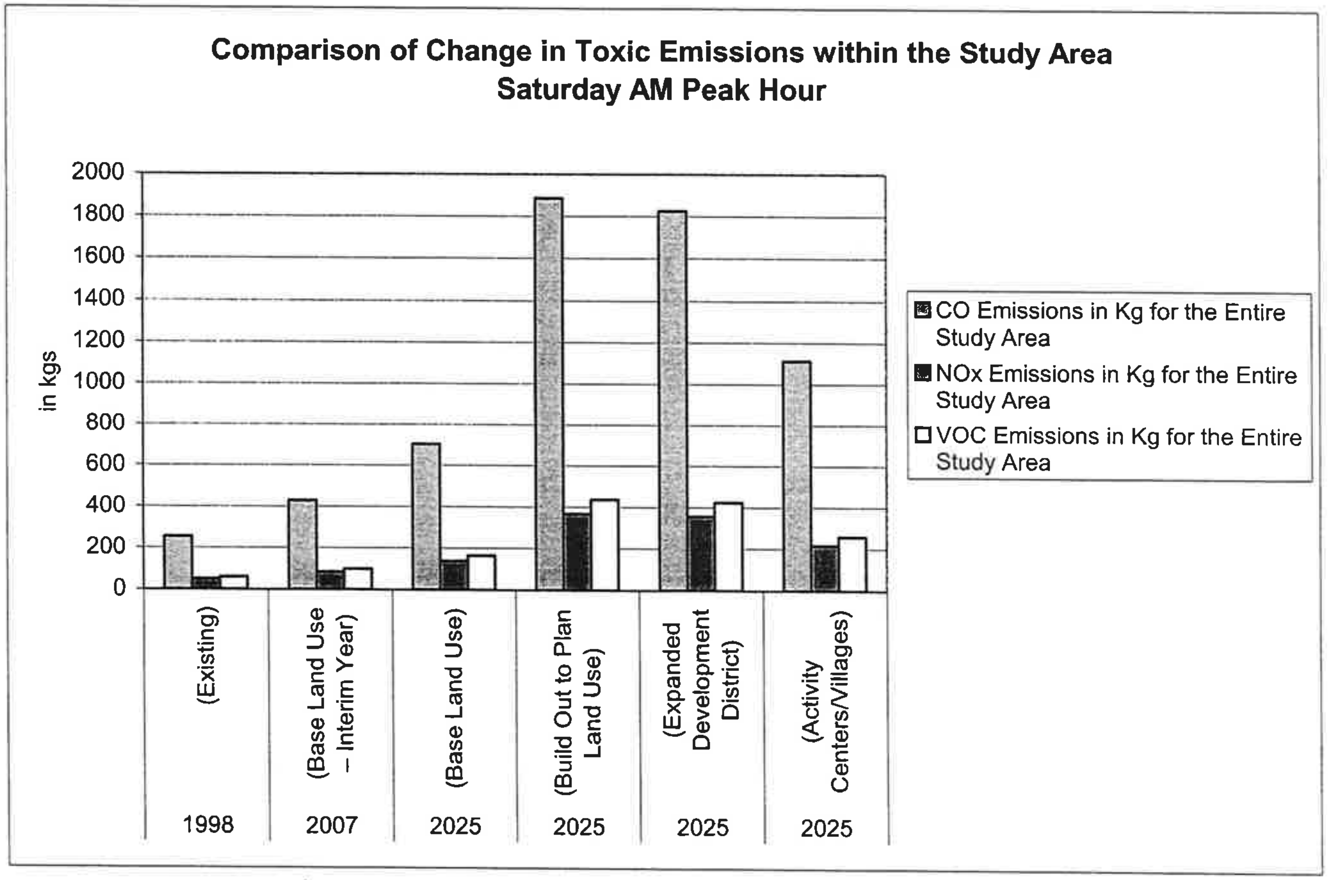
MEASURES OF EFFECTIVENESS (MOEs) (Sat. AM Peak Hour)	NETWORKS				
	Between 1998 (Existing) & 2007 (Base Land Use – Interim Year)	Between 1998 (Existing) & 2025 (Base Land Use)	Between 1998 (Existing) & 2025 (Build Out to Plan Land Use)	Between 1998 (Existing) & 2025 (Expanded Development District)	Between 1998 (Existing) & 2025 (Activity Centers/Villages)
Change in Network VMT	+ 28%	+ 61%	+ 123%	+127%	+ 88%
Change in Network VHT	+ 82%	+ 214%	+ 846%	+868%	+ 445%
Change in Network Average Speed	- 42%	- 96%	- 324%	- 327%	- 190%
Change in Network Total Signal Delay	+ 107%	+ 287%	+ 1184%	+1213%	+ 613%
Change Network Signal Delay/ Vehicle	+ 60%	+ 143%	+ 506%	+511%	+ 296%
Change in Network Queuing Penalty	+ 85%	+ 279%	+ 456%	+482%	+ 413%
Change in # of Unserved Vehicles	+ 200%	+ 638%	+ 1053%	+1120%	+ 873%
Change in Network Performance Index	- 101%	- 279%	- 1036%	-1037%	- 562%

TABLE 3
Entire Study Area Comparative Environmental Analysis for All the Land Use Scenarios Considered

MEASURES OF EFFECTIVENESS (MOEs) (Sat. AM Peak Hour)	NETWORKS					
	1998 (Existing)	**2007 (Base Land Use – Interim Year)**	**2025 (Base Land Use)**	**2025 (Build Out to Plan Land Use)**	**2025 (Expanded Development District)**	**2025 (Activity Centers/Villages)**
Fuel Consumption for Overall Network in Gallons	3,631	6,134	10,086	26,988	26,136*	15,917
Overall Network Fuel Economy (Miles per Gallon)	11.3	8.6	6.5	3.4	3.6*	4.8
CO Emissions in Kg for the Entire Study Area	253.78	428.77	705.04	1886.46	1826.90*	1112.62
NOx Emissions in Kg for the Entire Study Area	49.38	83.42	137.17	367.04	355.45*	216.47
VOC Emissions in Kg for the Entire Study Area	58.82	99.37	163.40	437.21	423.40*	257.86

*Although VMT and VHT figures for the Expanded Development District Scenario are higher than that of the Build Out to Plan Scenario, the fuel consumption, fuel economy and emissions numbers for the Expanded Development District Scenario are slightly better than that of for the Build Out to Plan Scenario. This may have occurred due to likely change in the trip lengths for the redistributed trips in the Expanded Development District Scenario. For example, from fuel consumption and emissions point of view, few longer trips offer better results than many short distance trips even if the overall miles traveled remain the same.

FIGURE 3


Comparison of Change in Toxic Emissions within the Study Area
Saturday AM Peak Hour
in kgs
2000
1800
1600
1400
1200
1000
800
600
400
200
0
(Existing)
1998
(Base Land Use – Interim Year)
2007
(Base Land Use)
2025
(Build Out to Plan Land Use)
2025
(Expanded Development District)
2025
(Activity Centers/Villages)
2025
CO Emissions in Kg for the Entire Study Area
NOx Emissions in Kg for the Entire Study Area
VOC Emissions in Kg for the Entire Study Area

Summary of the Entire Study Area Comparative Analysis:

- The comparison of measures of effectiveness between the Build Out to Plan Land Use and Expanded Development District Scenarios indicates a minimal change. This is mainly because additional trips in the Expanded Development District Scenario are only 0.6% more (only 213 more trips) than that for the Build Out to Plan Scenario.

- With the same development potential, the MOEs related to the Activity Center/ Village Scenario are much better than that of the Expanded Development District Scenario due to the compact, mixed-use nature of the development. The overall study area VMT has been reduced by 17% (from 92,828 miles to 77,067 miles) while the overall study are VHT has been reduced by almost 44% (from 28,455 hours to 16,031 hours) in the Activity Center/Village Scenario compared to the Expanded Development District Scenario. The reduction in VHT is much higher than that of VMT, which indicates that a small change in VMT has magnifying impacts on VHT, which is a sign of a saturated network. The Activity Center Scenario MOEs are better when compared with the Build Out to Plan Land Use Scenario also, although the development / growth in the Activity Center Scenario is slightly higher than that of the Build Out to Plan Scenario.

- Considering that the Build Out to Plan, Expanded Development District and Activity Center Scenarios have almost the same development potential, the Activity Center/Village Scenario presents the minimum impact on the transportation system among the three scenarios. The Activity Center/Village Scenario shows up to 50% improvement in the network MOEs compared to the other two scenarios.

Part II: Corridor Analysis

A. The SR1 Corridor:

TABLE 4
Comparative Traffic & Environmental Analysis for State Route 1 Corridor

MEASURES OF EFFECTIVENESS (MOEs) (Sat. AM Peak Hour)	NETWORKS					
	1998 (Existing)	2007 (Base Land Use – Interim Year)	2025 (Base Land Use)	2025 (Build Out to Plan Land Use)	2025 (Expanded Development District)	2025 (Activity Center/Village)
Corridor VMT	28,304	36,372	46,272	53,027	53,526	49,354
Corridor VHT	1,569	2,813	5,105	6,395	6,575	5,598
Corridor Average Speed	18.04 mph	12.93 mph	9.06 mph	8.29 mph	8.14 mph	8.82 mph
Corridor Total Signal Delay in Hours	945	2,010	4,084	5,225	5,394	4,509
Corridor Signal Delay/ Vehicle in Seconds	30	50	81	92	93	84
Corridor Queuing Penalty	10,231	18,168	37,462	45,180	46,998	41,789
Corridor Unserved Vehicles	4,017	11,490	29,356	41,281	42,981	34,107
Corridor Performance Index	1347.0	2728.9	5490.7	6914.2	7144.8	6068.8
Fuel Consumption for Corridor in Gallons	2,206	3,699	6,251	7,626	7,817	6,815

Corridor Fuel Economy (Miles per Gallon)	12.8	9.8	7.4	7.0	6.8	7.2
CO Emissions in Kg for the Corridor	154.20	258.57	436.96	533.05	546.41	476.38
NOx Emissions in Kg for the Corridor	30.00	50.31	85.02	103.71	106.31	92.69
VOC Emissions in Kg for the Corridor	35.74	59.93	101.27	123.54	126.63	110.41

Interpretation of the results for the SR1 Corridor:

- The percentile reduction in the corridor VMT (7.8% - from 53,526 miles to 49,354 miles) between the Expanded Development District Scenario and the Activity Center/Village Scenario is less as compared to that of overall study area percentile VMT reduction (17%) between these two scenarios. This indicates that the SR1 corridor is already saturated and the reduction in the necessity for local residents to access the SR1 corridor has smaller impacts on the performance of this corridor. Thus, to achieve considerable improvement in the performance of the SR1 Corridor, actual transportation improvements (like capacity improvement, signal co-ordination etc.) would be essential in addition to the land use strategies like compact, mixed-use activity centers or villages.

B. The SR18 Corridor:

TABLE 5
Comparative Traffic & Environmental Analysis for State Route 18 Corridor

MEASURES OF EFFECTIVENESS (MOEs) (Sat. AM Peak Hour)	NETWORKS					
	1998 (Existing)	2007 (Base Land Use – Interim Year)	2025 (Base Land Use)	2025 (Build Out to Plan Land Use)	2025 (Expanded Development District)	2025 (Activity Center/Village)
Corridor VMT	1,797	2,137	2,810	3,602	4,181	3,411
Corridor VHT	61	111	200	311	455	304
Corridor Average Speed	29.46 mph	19.25 mph	14.05 mph	11.58 mph	9.19 mph	11.22 mph
Corridor Total Signal Delay in Hours	28	75	153	246	382	245
Corridor Signal Delay/ Vehicle in Seconds	19	44	67	78	97	88
Corridor Queuing Penalty	241	186	1,392	2,060	3,224	3,141
Corridor Unserved Vehicles	0	405	912	1,198	2,174	1,842
Corridor Performance Index	42.6	94.0	213.6	339.6	521.8	365.1
Fuel Consumption for Corridor in Gallons	119	190	307	468	648	442

Corridor Fuel Economy (Miles per Gallon)	15.1	11.3	9.1	7.7	6.4	7.7
CO Emissions in Kg for the Corridor	8.32	13.26	21.48	32.72	45.33	30.90
NOx Emissions in Kg for the Corridor	1.62	2.58	4.18	6.37	8.82	6.01
VOC Emissions in Kg for the Corridor	1.93	3.07	4.98	7.58	10.51	7.16

Interpretation of the results for the SR18 Corridor:

- The improvement in the corridor MOEs for the Activity Center Scenario compared to the Expanded Development District Scenario is moderate. The corridor MOEs for the Activity Center and Build Out to Plan Land Use Scenarios are almost the same. The MOE comparison for all the four scenarios do not show a large change in the absolute numbers related to the MOEs, although Route 18 is a major access route to the City of Lewes. This is mainly because of two reasons. First, only a small section of Route 18 is included in the study area and the other reason is that land along this corridor has been mostly developed or is under construction.

C. The SR24 Corridor:

TABLE 6
Comparative Traffic & Environmental Analysis for State Route 24 Corridor

MEASURES OF EFFECTIVENESS (MOEs) (Sat. AM Peak Hour)	NETWORKS					
	1998 (Existing)	2007 (Base Land Use – Interim Year)	2025 (Base Land Use)	2025 (Build Out to Plan Land Use)	2025 (Expanded Development District)	2025 (Activity Center/Village)
Corridor VMT	2288	2984	3,451	6,209	6,314	5,525
Corridor VHT	63	90	147	530	557	543
Corridor Average Speed	36.31 mph	33.15 mph	23.48 mph	11.71 mph	11.34 mph	10.17 mph
Corridor Total Signal Delay in Hours	21	35	80	412	437	535
Corridor Signal Delay/ Vehicle in Seconds	16	21	40	111	116	155
Corridor Queuing Penalty	429	1,202	2,576	9,232	9,610	9,916
Corridor Unserved Vehicles	0	2	238	3,311	3,509	3,436
Corridor Performance Index	38.8	77.5	165.7	544.5	581.1	883.9
Fuel Consumption for Corridor in Gallons	119	168	239	774	802	903

Corridor Fuel Economy (Miles per Gallon)	19.2	17.8	14.5	8.0	7.9	6.1
CO Emissions in Kg for the Corridor	8.35	11.73	16.68	54.09	56.08	63.15
NOx Emissions in Kg for the Corridor	1.62	2.28	3.24	10.52	10.91	12.29
VOC Emissions in Kg for the Corridor	1.94	2.72	3.87	12.54	13.00	14.64

Interpretation of the results for the SR24 Corridor:

- The decrease in the corridor VMT between the Expanded Development District Scenario and the Activity Center/Village Scenario is comparatively less mainly because two of the five activity centers in the Study area are located on SR24. These activity centers impose many short distance trips on SR24. Due to these short distance trips, the VHT related to the corridor has not reduced considerably compared to VMT. The majority of the MOEs for this corridor, like total corridor signal delay, signal delay per vehicle, average speed, queuing penalty etc, deteriorate in the Activity Center/Village Scenario compared to the Expanded Development District Scenario. The overall performance of this corridor decreases, as reflected by the corridor performance index number, in the Activity Center/Village Scenario.

- In the Activity Center/Village Scenario, the SR24 corridor is likely to have many short distance trips, with two activity centers as focal points. The change in the trip length character along the corridor is also reflected by increase in the fuel consumption along this corridor. The increase in the fuel consumption, despite the decrease in the corridor VMT, indicates that there are many short distance trips on this corridor, which results in declined fuel economy and in turn, higher fuel consumption.

C. The RD 275 Corridor:

TABLE 7
Comparative Traffic & Environmental Analysis for State Road 275 Corridor

MEASURES OF EFFECTIVENESS (MOEs) (Sat. AM Peak Hour)	NETWORKS					
	1998 (Existing)	2007 (Base Land Use – Interim Year)	2025 (Base Land Use)	2025 (Build Out to Plan Land Use)	2025 (Expanded Development District)	2025 (Activity Center/Village)
Corridor VMT	2,231	2,816	3,504	7,142	7,363	5,847
Corridor VHT	67	150	280	1,204	1,352	749
Corridor Average Speed	33.30 mph	18.77 mph	12.51mph	5.93 mph	5.45 mph	7.80 mph
Corridor Total Signal Delay in Hours	25	96	213	1,069	1,212	642
Corridor Signal Delay/ Vehicle in Seconds	20	59	110	258	278	186
Corridor Queuing Penalty	193	513	899	2,153	2,276	2,115
Corridor Unserved Vehicles	0	124	271	992	1,082	856
Corridor Performance Index	36.5	120.2	253.5	1178.9	1371.5	738.8
Fuel Consumption for Corridor in Gallons	124	212	344	1,252	1,564	841

Corridor Fuel Economy (Miles per Gallon)	18.1	13.3	10.2	5.7	5.0	6.9
CO Emissions in Kg for the Corridor	8.63	14.81	24.02	87.48	109.29	58.82
NOx Emissions in Kg for the Corridor	1.68	2.88	4.67	17.02	21.16	11.44
VOC Emissions in Kg for the Corridor	2.00	3.43	5.57	20.28	25.33	13.63

Interpretation of the results for the Rd 275 Corridor:

- The MOE comparisons for the corridor between the Expanded Development District Scenario and the Build Out to Plan Scenario indicate that even with a small increase in the corridor VMT, the overall impact on the performance of the corridor is comparatively high as reflected by the change in the corridor VHT, total signal delay and corridor performance index.

- The improvement in the corridor MOEs for the Activity Center Scenario compared to the Expanded Development District Scenario is significant. It shows almost 47% improvement in the total corridor signal delay and corridor performance index. This is mainly due to an increase in internal trips as a result of the compact, mixed-use development in the activity centers. Two of the five activity centers in the study area are on Rd. 275.

Part III: Functional Classification Analysis

TABLE 8
Comparative VMT Analysis by Functional Classification

Functional Class (Sat. AM Peak Hour)	NETWORKS					
	1998 (Existing)	2007 (Base Land Use – Interim Year)	2025 (Base Land Use)	2025 (Build Out to Plan Land Use)	2025 (Expanded Development District)	2025 (Activity Center/Village)
Other Principal Arterials (SR1, SR18 west of SR1, Kings Highway)						
VMT	30,357	38,758	49,370	57,127	58,205	53,267
Major Collectors (SR18 east of SR1, SR 23, SR 24)						
VMT	3,266	4,115	4,939	9,037	9,817	7,783
Minor Arterials (SR1A, Road 268 from SR1 to Dartmouth Road)						
VMT	1,744	2,626	2,687	3,270	3,325	2,840
Local Roads (Remaining roadways in the study area)						
VMT	5,537	6,966	8,730	21,947	21,481	13,177

Interpretation of the results:

- The VMT comparison between the Expanded Development District and Activity Center/Village Scenarios by functional classification shows that the Activity Center/Village Scenario benefits local traffic the most while it has lesser impacts on the major roadway corridors within the study area. The Activity Center/Village Scenario is mainly based on the concept of compact, mixed-use development, which promotes more local internal trips and a reduction in the requirement for the local traffic to access SR1. The significant reduction in the VMT associated with local roads (almost 39%) reflects the concept of the activity center/neighborhood shopping.

- The overall reduction in the VMT between the Expanded Development District and Activity Center/Village scenarios is 15,761 miles, of which, almost 53% (8,304 miles) has been reduced on local roads, where the local roads only contribute 23% of the entire VMT (21,481 VMT on local roads compared to overall 92,828 VMT within the network). This shows a direct positive impact on the quality of life for residents in the study area.

Part IV: Signalized Intersections Analysis

TABLE 9
Summary of the Signalized Intersection Performance

Level of Service (Sat. AM Peak Hour)	# of Signalized Intersections					
	1998 (Existing)	**2007 (Base Land Use – Interim Year)**	**2025 (Base Land Use)**	**2025 (Build Out to Plan Land Use)**	**2025 (Expanded Development District)**	**2025 (Activity Center/Village)**
Acceptable (A, B, C or D)	13	9	2	0	0	1
At Capacity or Failing (E or F)	4	8	15	17	17	16

TABLE 10
Comparative Signalized Intersection Performance Analysis

Signalized Intersection (Sat. AM Peak Hour)	NETWORKS					
	1998 (Existing)	**2007 (Base Land Use – Interim Year)**	**2025 (Base Land Use)**	**2025 (Build Out to Plan Land Use)**	**2025 (Expanded Development District)**	**2025 (Activity Center/Village)**
State Route 18 & Road 285B						
Intersection LOS	D	F	F	F	F	F
Int. Capacity Utilization	80.9%	94.8%	124.0%	135.2%	235.1%	145.5%
Intersection Signal Delay	36.2 sec.	84.6 sec.	124.9 sec.	117.9 sec.	222.8 sec.	153.8 sec.
State Route 18 & State Route 1						
Intersection LOS	F	F	F	F	F	F
Int. Capacity Utilization	106.3%	135.0%	177.6%	211.3%	210.5%	199.3%
Intersection Signal Delay	156.8 sec.	201.4 sec.	237.9 sec.	238.4 sec.	230.3 sec.	229.4 sec.

State Route 1 & Westcoats Road						
Intersection LOS	B	D	E	F	F	F
Int. Capacity Utilization	78.6%	99.6%	123.9%	151.5%	155.7%	144.7%
Intersection Signal Delay	13.1 sec.	42.3 sec.	77.7 sec.	118.7 sec.	121.4 sec.	101.7 sec.
State Route 1 & Dartmouth Drive						
Intersection LOS	F	F	F	F	F	F
Int. Capacity Utilization	108.4%	113.1%	136.9%	180.2%	183.3%	184.1%
Intersection Signal Delay	103.8 sec.	127.9 sec.	202.5 sec.	214.8	222.1 sec.	223.1 sec.
State Route 1 & Road 283						
Intersection LOS	C	C	E	F	F	F
Int. Capacity Utilization	90.0%	88.4%	110.4%	137.3%	138.3%	121.3%
Intersection Signal Delay	25.0 sec.	22.9 sec.	75.2 sec.	141.4 sec.	143.2 sec	87.5 sec.
State Route 1 & Midway Shopping						
Intersection LOS	C	D	F	F	F	F
Int. Capacity Utilization	91.8%	94.2%	117.9%	117.9%	118.9%	118.0%
Intersection Signal Delay	24.4 sec.	36.8 sec.	123.1 sec.	101.0 sec.	101.9 sec.	100.5 sec.
State Route 1 & State Route 24						
Intersection LOS	C	D	F	F	F	F
Int. Capacity Utilization	78.9%	100.5%	130.8%	153.2%	156.9%	167.2%
Intersection Signal Delay	25.6 sec.	37.0 sec.	93.9 sec.	119.6 sec.	125.6 sec.	113.9 sec.
State Route 1 & Rehoboth Mall Road						
Intersection LOS	A	A	C	E	E	C
Int. Capacity Utilization	61.4%	67.7%	98.0%	108.4%	109.1%	103.4%
Intersection Signal Delay	0.7 sec.	0.8 sec.	21.9 sec.	56.2 sec.	59.6 sec.	25.6 sec.
State Route 1 & Road 274						
Intersection LOS	C	D	F	F	F	F
Int. Capacity Utilization	82.6%	109.1%	131.7%	171.2%	168.3%	135.8%
Intersection Signal Delay	33.5 sec.	50.6 sec.	116.4 sec.	126.0 sec.	122.7 sec.	97.8 sec.
State Route 1 & Munchy Branch Road						
Intersection LOS	C	E	F	F	F	F
Int. Capacity Utilization	100.4%	128.1%	149.6%	155.6%	157.0%	153.9%
Intersection Signal Delay	32.0 sec.	66.5 sec.	120.1 sec.	131.1 sec.	133.5 sec.	114.0 sec.

State Route 1 & Camelot Drive						
Intersection LOS	C	F	F	F	F	F
Int. Capacity Utilization	82.0%	175.7%	212.0%	233.2%	238.0%	219%
Intersection Signal Delay	22.8 sec.	133.1 sec.	173.9 sec.	186.9 sec.	190.3 sec.	181 sec.
State Route 1 & K-Mart Access						
Intersection LOS	B	D	F	F	F	F
Int. Capacity Utilization	84.4%	106.4%	123.7%	136.6%	137.9%	124.7%
Intersection Signal Delay	16.1 sec.	37.5 sec.	84.0 sec.	122.0 sec.	123.7 sec.	100.3 sec.
State Route 1 & Road 273						
Intersection LOS	B	D	F	F	F	F
Int. Capacity Utilization	82.0%	102.7%	121.3%	142.1%	143.0%	123.1%
Intersection Signal Delay	18.1 sec.	42.5 sec.	84.1 sec.	108.5 sec.	109.4 sec.	88.3 sec.
State Route 1 & Rehoboth Ave.						
Intersection LOS	F	F	F	F	F	F
Int. Capacity Utilization	106.5%	141.8%	164.9%	189.5%	191.2%	182.6%
Intersection Signal Delay	217.0 sec.	275.1 sec	288.2 sec.	298.1 sec.	298.9 sec.	302.1 sec
State Route 1 & Bay Vista Road						
Intersection LOS	F	F	F	F	F	F
Int. Capacity Utilization	74.4%	85.6%	99.7%	126.7%	127.2%	114.2%
Intersection Signal Delay	93.7 sec.	154.2 sec.	202.9 sec.	261.4 sec.	262.3 sec.	244.4 sec.
State Route 24 & Rehoboth Mall						
Intersection LOS	A	A	A	F	F	F
Int. Capacity Utilization	54.3%	85.2%	101.9%	205.7%	211.9%	202.8%
Intersection Signal Delay	5.4 sec.	4.8 sec.	6.8 sec.	172.3 sec.	179.6 sec.	146.6 sec.
State Route 24 & Road 275						
Intersection LOS	C	E	F	F	F	F
Int. Capacity Utilization	80.2%	97.1%	120.0%	188.6%	189.0%	193.2%
Intersection Signal Delay	30.2 sec.	64.1 sec.	96.1 sec.	221.5 sec.	226.7 sec.	233.9 sec.

State Route 1 Land Use & Transportation Plan

Appendix III Transportation Alternatives

A. Development of the Transportation Alternatives
B. Signal System Optimization
C. Transportation Alternatives 1A and 1B Analysis
D. Transportation Alternative 2 Analysis
E. Transportation Alternative 3A Analysis
F. Transportation Alternative 3B Analysis

State Route 1 Land Use/Transportation Study

Technical Memorandum

A. Development of the Transportation Alternatives

Prepared For:
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DelDOT

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DMJM HARRIS

I. Introduction

The purpose of this memorandum is to document the transportation problems heard during the public involvement process conducted for the SR1 Land Use & Transportation Study and to outline possible solutions to address these transportation problems as was heard during the public involvement process, as well. These public and Public Advisory Committee comments helped to shape the transportation alternatives examined in the study.

II. Major Transportation Problem Areas

The following provides a listing of the major transportation problem areas the study team has heard during the public involvement process. Corresponding to the each of the major problem areas is information that was developed during the transportation demand analysis. This information provides the context of the analytical findings that were generated in the study.

Major Transportation Problem Areas

What We Have Heard	What the Traffic Analysis Shows
Five Points Intersection	A failing signalized intersection under existing conditions with heavy backups. By 2025, intersection delay would be more than 225 seconds. By 2025, the maximum volume to capacity ratio would be more than three along the SR1 approaches.
Congestion and delays on SR1	Traffic volumes under existing conditions for Saturday AM peak hour (summer) exceed capacity along the SR1 corridor between Five Points and Rehoboth Avenue. By 2025, the corridor would be saturated with excessive congestion and average speed along the corridor would drop as low as 8 mph while the total corridor signal delay can go as high as 5,394 hours in 2025 compared to existing 945 hours.
Difficult accessing SR1 from intersecting streets	Under the existing Saturday AM peak hour condition, through and left-turn approaches from all the side streets within the study area except two are almost failing (LOS E) or failing (LOS F). By 2025, the side streets would experience even higher delays and backups directly impacting the quality of life for residents.

Congestion and delays at the entrance to Rehoboth Beach	This is a failing signalized intersection under existing conditions with heavy backups. By 2025, intersection delay would be more than 275 seconds. By 2025, the maximum volume to capacity ratio would be almost twice the actual intersection capacity.
Accommodating through traffic	Under existing summer Saturday AM peak hour conditions, through traffic is slightly over one-quarter of SR1 traffic volumes (27%) which mixes with the resort traffic attracted by the study area, the traffic attracted by outlet malls and local traffic. By 2025, due to significant increase in local traffic due to land development within the study area and saturation of the SR1 corridor (with excessively high delays and backups), the corridor would discourage through traffic. Through traffic would shift to alternative roadways like US 113.
Lack of pedestrian mobility	The SR1 corridor lacks a continuous sidewalk system. There is a lack of pedestrian overpasses despite the width of the corridor and commercial attractions on the either side of the corridor.
Performance of the SR1/SR24 intersection	By 2025, due to significant development along SR24 and background traffic growth along SR24 (a major regional roadway), the intersection of SR1 and SR24 would pose severe congestion problems. By 2025, traffic volumes at this intersection would be more than twice the capacity of the intersection.
Impacts on Road 275 (Plantations Road)	Like SR1, Road 275 becomes saturated due to significant new development within the study area. The Road 275 corridor will require additional capacity to handle 2025 traffic volumes effectively. This capacity can be provided to the existing roadway (with impacts to adjacent residential neighborhoods) or can be provided on a new alignment.

III. Transportation Solutions Heard in the Public Involvement Process

The following provides a listing of the transportation solutions the study team heard during the public involvement process. Corresponding to each solution is information on constraints, an assessment of the general feasibility of the solution and a general assessment of the effectiveness of the solution in addressing the problem.

Transportation Solutions Heard Through the Public Involvement Process

Five Points Intersection Congestion			
Solutions Heard	**Some Constraints**	**Feasibility**	**Effectiveness**
Grade Separated Interchange	Many land parcels in the vicinity of the intersection have been developed. Close to a historic district.	Medium	High
Congestion on SR1			
Solutions Heard	**Some Constraints**	**Feasibility**	**Effectiveness**
Access/service roads High speed lanes and service roads Separate local and through traffic	Construction of access road and parallel service roads require wide right-of-way for construction and the corridor is already developed. Intersections would still remain as problem areas.	Low	Medium
SR1 limited access road Overpass at SR1 & US9 Grade separation at US9, SR24 & Rehoboth Avenue	Majority of the corridor is developed, which makes grade separation and limiting access difficult due to land availability issues and property access rights.	Medium	High

Solutions Heard	Some Constraints	Feasibility	Effectiveness
Overhead express road parallel to SR1 4-lane elevated highway	Not very feasible from a construction and cost standpoint (low benefit to cost ratio). Transitioning to other roadways (non-elevated roadways) is problematic. Would help to move through traffic component effectively but can not help to address the most pressing future traffic problem in the area (locally generated and attracted traffic) when the study area develops.	Low	Low
Jug handles with long egress and access at major roads	Would improve signal phasing but difficult from construction viewpoint and from land availability viewpoint as majority of the corridor is already developed.	Medium	Medium
Limited bypass around study area	Requires a feasible and suitable alignment respecting social and environmental issues.	Medium	High
Use median to create another lane	Would improve capacity on SR1 but can not help traffic congestion on intersecting streets. Limited median width, where median is even present.	Low	Medium
Optimize signal timings Co-ordinate signal phasing for all the signals along the SR1 corridor	Although optimization & coordination of signal timings along the SR1 corridor can be expected to reduce total signal delay by about 10%, the improvement is negligible compared to present & expected corridor delay.	High	Medium

Access to SR1			
Solutions Heard	**Some Constraints**	**Feasibility**	**Effectiveness**
Longer lights for intersecting roads to allow traffic to enter SR1	Signal phase timings are based on the traffic volumes along the approaches at an intersection. Within the study area, SR1 traffic volumes are much higher than intersecting street volumes. Thus, longer lights for intersecting streets would further deteriorate the performance of the SR1 corridor.	Low	Very Low
Congestion and Delays at the Entrance to Rehoboth Beach			
Solutions Heard	**Some Constraints**	**Feasibility**	**Effectiveness**
Build 2-3 lane bridge into Rehoboth Overpass to cross northbound traffic	Grade separated SR1 and Rehoboth Avenue interchange would be effective to move traffic but it has constraints from construction standpoint due to existing development near this intersection and availability of land to construct a grade separated ramp system.	Medium	High
Accommodating Through Traffic			
Solutions Heard	**Some Constraints**	**Feasibility**	**Effectiveness**
Use flashing signs "Use US 113"	If ITS variable message signs were placed at US113 and SR1 split warning motorists of likely congestion along SR1, it would help divert some through traffic on US113. Need to ensure commensurate travel times on US113 (north-south study).	High	Medium High

Pedestrian Mobility			
Solutions Heard	**Some Constraints**	**Feasibility**	**Effectiveness**
Pedestrian overpass from Camelot to K-Mart Overpasses in Dewey and at outlets Overpass between Outlet Centers 2 & 3	Requires sufficient vertical clearance due to commercial truck traffic along SR1. Requires much right of way to provide for ADA ramps.	High	High
Continuous side-walk system along SR1 within the study area	May have some right-of way issues since the corridor is already wide. Presence of utilities in roadway border area is an issue.	Medium High	Medium

The above major transportation solutions (with the addition of some minor improvements that were also identified by the Public Advisory Committee and the public) can be re-organized based on the time frame for implementation. The short-term category indicates improvement solutions that could be implemented in shorter time spans based on their viability. The long-term category indicates major solutions, which would be included in a long-range program.

Short-Term Solutions	Long-Term Solutions
• Synchronize all traffic signals along SR1 → Traffic Signal at Rehoboth Avenue and Bay Vista Road are not synchronized. • Improve signage on SR1 and provide clear directions to Rehoboth Beach • Install ITS Variable Message Signs north of the study area to divert traffic based on congestion level • Re-align and signalize Postal Lane/Plantations Road/Cedar Grove Road intersection. • Regulate the Resort Bus Service → 25mph speed limit restriction strictly enforced → Provide guidelines to bus drivers to use	• Relieve Congestion on SR1 corridor → Express and Service roadway concept → SR1 as limited access roadway → Grade separation at SR18, SR24 and SR1A (Rehoboth Avenue) → Capacity improvement along SR1 → Analyze the feasibility of limited bypass around the study area. → Improve Capacity along Plantations Road → Analyze feasibility and effectiveness of a new roadway link parallel to Plantations Road • Access to SR1 from side streets → Improve capacity on SR24 → Consider grade separation at key intersections (SR18, SR24, SR1A)

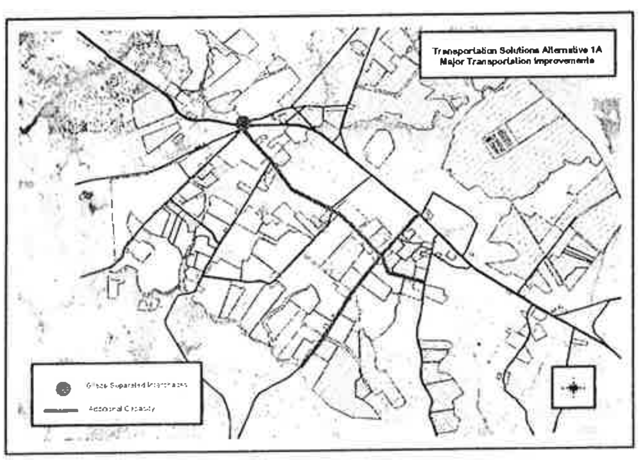
traffic lanes when flow conditions are good rather than using diamond lanes all the time. • Other →Analyze possibility and impacts of eliminating some unsignalized left turns from SR1. → Intersection improvement study for Rd 274 and Rd 275 intersection.	• Entrance to Rehoboth Beach → Build 2-3 lane bridge into Rehoboth (i.e grade separation at SR1) → Provide access road from Nassau to Rehoboth on Rt.16 • Pedestrian Mobility → Multi-use paths or other treatments on both sides along the entire length of SR1 within the study area → Analyze feasibility of pedestrian overpass / tunnel • Other → Improve bridge between Dewey and Rehoboth

Reflecting the above problems, possible solutions and short and long range demarcations, the study team developed the following major transportation alternatives to examine in the SR1 Land Use & Transportation Study.

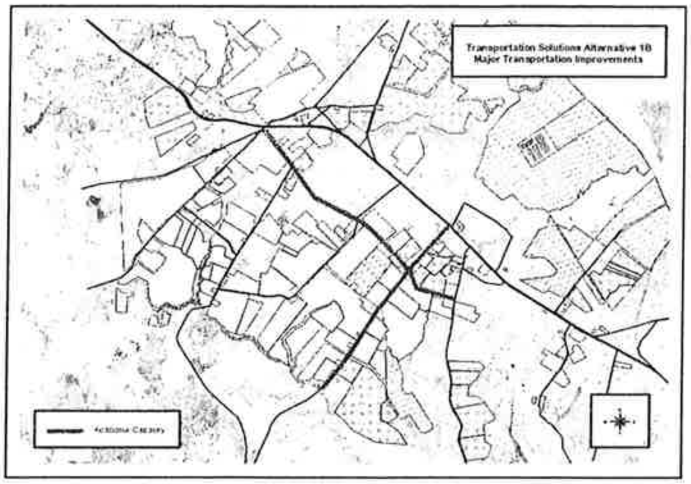
Alternative 1A and 1B
This alternative incorporates the solution of providing additional roadway capacity to existing facilities (Road 275 and SR24). These facilities require additional capacity based on the analysis completed on the base land use scenario as well as all future land use scenarios examined. This alternative was developed to address the problem of existing and future congestion on the SR1 corridor and future congestion on the SR24 corridor and Road 275 corridor.

This alternative will be examined with and without a grade-separated interchange at the Five Points intersection. The grade-separation alternative at Five Points addresses the congestion present in the existing condition at this intersection.

Alternative 1A



Alternative 1B

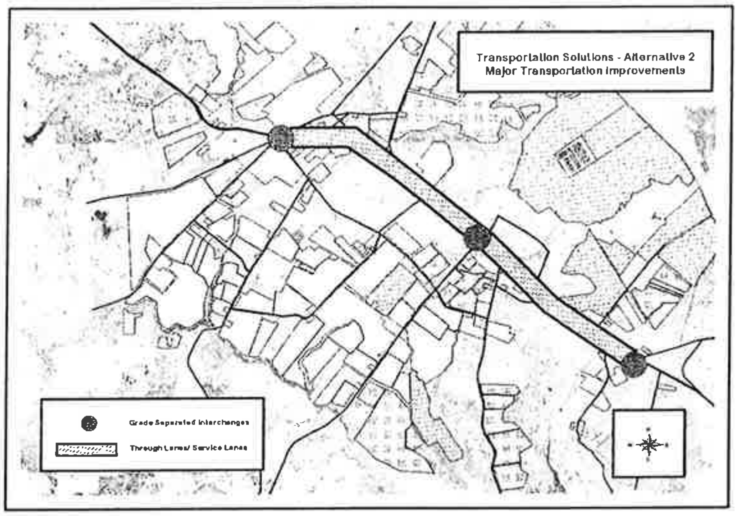


Alternative 2

This alternative incorporates the solution of providing a service and express roadway concept to SR1. Inner lanes would be express lanes while outside lanes would function as one-way local lanes. These express lanes would be barrier separated with slip ramps allowing access to and from the local lanes. Express lanes would operate as a free flow facility without traffic signals. Local lanes would have traffic signals controlling movements from major intersecting streets and driveways, where needed. This alternative was developed to address the problem of existing and future congestion on the SR1 corridor. Under this improvement alternative, the SR1 corridor will attempt to provide mobility for both through traffic as well as local traffic.

This alternative will be examined with grade-separated interchanges at Five Points, SR24 and Rehoboth Avenue intersections. These grade-separations improvements address the congestion present under existing conditions at these intersections. Additionally, interchanges are needed to provide opportunities for through and local travel to reverse direction or to cross SR1 in a traffic environment where separate through and local lanes are operating.

Alternative 2



Alternative 3A1, 3A2, 3A3 and 3B1, 3B2, and 3B3

These alternatives incorporate the solution of providing additional roadway capacity on a new roadway facility. The need for additional capacity in the SR1 study area was identified in the analysis completed on the base land use scenario as well as all future land use scenarios examined. This alternative was developed to address the problem of existing and future congestion on the SR1 corridor, and future congestion on the SR24 corridor and the Road 275 corridor. As the study area develops, the new roadway would serve to divert local trips from SR 1 and Road 275, thus improving flow on these existing facilities.

These alternatives will be examined with and without a grade-separated interchange at the Five Points intersection. The grade-separation alternative at Five Points addresses the congestion present under the existing condition at this intersection.

The roadway options of 1, 2 and 3 provide various options for the continuation of the facility to the east of SR24. They have been considered in such a way to minimize impact on existing development and environmentally sensitive areas at the same time as improving local mobility.

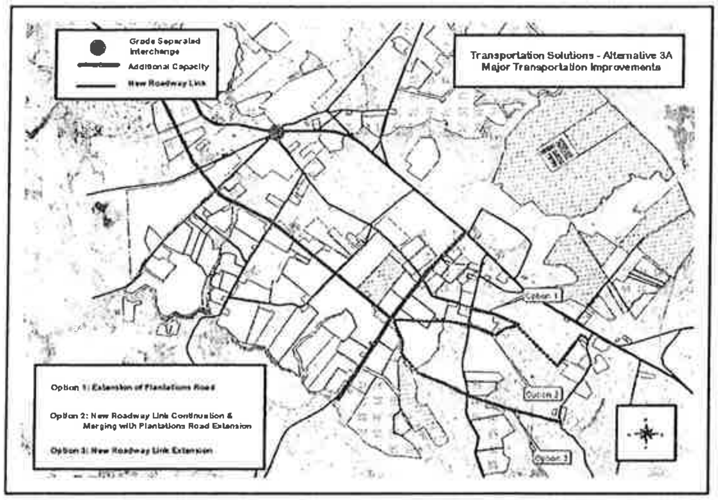
Under Alternative 3A the following is assumed:

- Grade separated diamond interchange at the Five Points intersection.
- The new roadway will be a controlled access roadway (between north of Five Points and SR24) with signalized intersections.
- SR24 corridor within the study area as a 4-lane roadway.

For the continuation options east of SR24 the following are assumed as sub-alternatives:

- Option 3A1: Road 275 (Plantations Road) extension up to Road 273.
- Option 3A2: Road 275 (Plantations Road) extension up to Road 273 with a direct connection from new bypass alignment.
- Option 3A3: Continuation of limited bypass alignment between SR24 and Rd. 273.

Alternative 3A1, 3A2 & 3A3

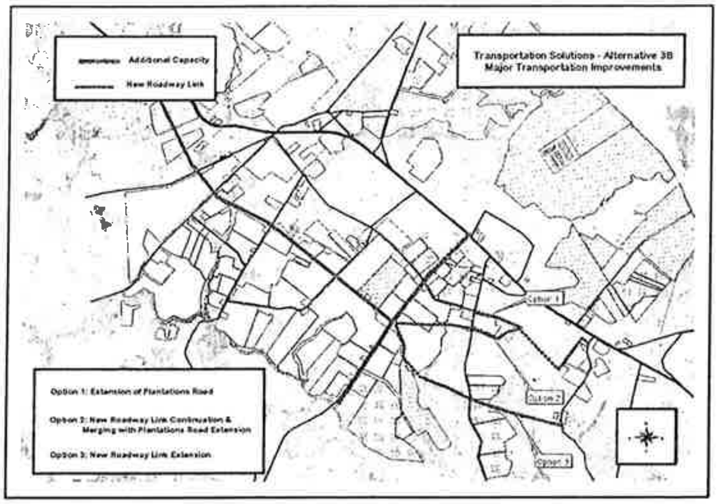


For Alternative 3B the following are assumed:
- Controlled access alignment (between north of Five Points and SR24) with signalized intersections.
- SR24 corridor with 4-lane section.

Similar to the other alternative, similar alignments for the extension of the new roadway east of SR 24 are assumed as sub-alternatives:

- Option 3B1: Road 275 (Plantations Road) extension up to Road 273.
- Option 3B2: Road 275 (Plantations Road) extension up to Road 273 with a direct connection from new bypass alignment.
- Option 3B3: Continuation of limited bypass alignment between SR24 and Rd. 273.

Alternative 3B1, 3B2 & 3B3



IV. Next Steps

The travel demand modeling process will be used to evaluate the effectiveness of the above transportation alternatives. The 2025 TranPlan and Synchro networks established for the preferred land use scenario (activity center/village scenario) with network signals optimized and coordinated will be used as the base network, representing the No Build Condition. This No Build Condition will be used as a comparative benchmark to determine how well each of the alternatives perform in terms of changes to the measures of effectiveness (MOEs) established and used during the analysis of the alternative land use scenarios.

State Route 1 Land Use/Transportation Study

Technical Memorandum

B. Signal System Optimization

Prepared For:
Delaware Department of Transportation

Prepared By:
DMJM+HARRIS
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I. Introduction:

The purpose of this memorandum is to document the qualitative and quantitative improvements in the performance of the SR1 study area transportation network due to optimization of the signal system for the preferred land use scenario.

<u>Process Used for Optimizing the Signal System in the Study Area:</u>

- There are 22 signalized intersections within the study area (including extended study area in Dewey Beach and Rehoboth Beach) of which 17 are on SR1. The northbound and southbound through movements are the dominant traffic movements along the SR1 corridor within the study area.

- First, the overall network wide coordination of signalized intersections within the study area was conducted using manual optimization option in Synchro: The following table shows comparative results with different cycle lengths.

Select Cycle Lengths

Cycle Length	Perform Index	Total Delay (hr	Delay / Veh (s)	Total Stops	Stops / Veh	Fuel (gal)	Queue Penalty	Unserved Vehicles	Dilemma Vehicles	% Dilemm Vehicles	Average Spd (mph
50	9274	6750	146	371192	2.23	10717	53736	44221	3910	2%	6
56	9195	6726	145	353718	2.12	10511	53530	42894	3867	2%	6
60	9371	6769	146	360612	2.16	10636	57607	44801	3886	2%	6
66	9047	6474	140	350257	2.10	10334	57580	44127	4362	3%	6
70	9370	6690	145	356582	2.14	10598	60829	46687	3967	2%	6
76	10191	7393	160	385437	2.31	11486	62205	55191	3165	2%	5
80	10348	7606	164	378420	2.27	11568	60875	56732	2962	2%	5
86	10379	7680	166	363525	2.18	11452	60807	63971	2471	1%	5
90	9738	7199	156	330096	1.98	10707	58407	62673	2230	1%	5
96	9900	7354	159	320301	1.92	10695	59618	60154	2442	1%	5
100	9233	6762	146	290246	1.74	9908	59920	58960	2240	1%	6
106	9548	6996	151	285852	1.72	10015	63287	57534	2374	1%	6
110	9734	7169	155	285639	1.71	10138	63786	56711	2118	1%	5
116	9373	6850	148	265103	1.59	9657	64311	55305	2355	1%	6
120	9532	6877	149	275391	1.65	9776	68043	54141	2345	1%	6
126	9737	7050	152	274371	1.65	9891	69296	52704	2393	1%	5
130	9200	6530	141	252421	1.51	9251	70862	51703	2227	1%	6
136	9334	6705	145	252800	1.52	9384	69360	50816	2195	1%	6
140	9496	6811	147	250376	1.50	9441	71629	50465	2127	1%	6
146	9713	6999	151	250985	1.51	9580	72604	49785	2091	1%	6
150	9170	6582	142	222294	1.33	8946	70957	49811	1987	1%	6
156	9325	6725	145	222477	1.33	9047	71362	48991	1892	1%	6
160	9468	6848	148	221107	1.33	9124	72200	48685	1953	1%	6

Zone: (all)

OK Cancel

Cycle Length: 66
Number of intersections: 22
Uncoordinated: 10
Half Cycled: 0
Locked Other: 0

Continued:

Select Cycle Lengths

Cycle Length	Perform Index	Total Delay (hr	Delay / Veh (s)	Total Stops	Stops / Veh	Fuel (gal)	Queue Penalty	Unserved Vehicles	Dilemma Vehicles	% Dilemm Vehicles	Average Spd (mph
76	10191	7393	160	385437	2.31	11486	62205	55191	3165	2%	5
80	10348	7606	164	378420	2.27	11568	60875	56732	2962	2%	5
86	10379	7680	166	363525	2.18	11452	60807	63971	2471	1%	5
90	9738	7199	156	330096	1.98	10707	58407	62673	2230	1%	5
96	9900	7354	159	320301	1.92	10695	59618	60154	2442	1%	5
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106	9548	6996	151	285852	1.72	10015	63287	57534	2374	1%	6
110	9734	7169	155	285639	1.71	10138	63786	56711	2118	1%	5
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146	9713	6999	151	250985	1.51	9580	72604	49785	2091	1%	6
150	9170	6582	142	222294	1.33	8946	70957	49811	1987	1%	6
156	9325	6725	145	222477	1.33	9047	71362	48991	1892	1%	6
160	9468	6848	148	221107	1.33	9124	72200	48685	1953	1%	6
166	9615	7000	151	218303	1.31	9208	72287	48000	1946	1%	6
170	9734	7118	154	219264	1.32	9295	72269	47714	1910	1%	5
176	9759	7255	157	215304	1.29	9362	68635	47126	1818	1%	5
180	9104	6582	142	200100	1.20	8680	70775	46847	1846	1%	6

Zone: (all)

Cycle Length: 66
Number of intersections: 22
Uncoordinated: 10
Half Cycled: 0
Locked Other: 0

OK Cancel

- The cycle length of 180 seconds was selected for the signal coordination purpose as this cycle length yields better overall performance (considering the various performance measures displayed in the above table) for the high traffic volumes along the SR1 corridor.

- Due to the excessive dominance of the through traffic movement along the SR1 corridor compared to the turning movements and side street traffic, the entire network wide signal optimization using Synchro was not an appropriate approach. The entire network wide signal optimization in Synchro uses an iterative method to adjust signal phasing, splits and offsets for all the intersection approaches and thus, it is not likely to yield maximum possible green time for the major traffic movement.

- Hence, the optimization process undertaken was based on manual adjustments to the signal phasing and cycle length for each of the signalized intersections individually and then optimizing the network offsets using Synchro. Manual adjustment of phase timings allowed an allocation of maximum possible green time to the major traffic movement wherever possible and thus, reduced the overall intersection delay at each of the signalized intersection. Network offset optimization, using Synchro, which followed the manual adjustments in phase timings and cycle lengths, helped to improve the coordination of the signal system with 180-second cycle length for the entire network.

- Cycle length for Five Points signalized intersection was reduced as it was displaying improved performance with a 90-second cycle length. Special consideration in cycle length was valid at this signalized intersection as it is a clustered signal operating in coordination with signalized intersection at US9 and SR23/Rd.275. The change in the cycle length from 180 seconds to 90 seconds will not impact the coordination of signals along the SR1 corridor within the study area as this location is at the northern end within the study area.

- The manual signal phasing adjustments were done considering that there would be no conflicting movements at the intersection. Also, the phase timing adjustments at each of these intersections were done considering there would be no minimum error, i.e. care was taken to ensure that the minimum split[1] for each movement is less than the total split[2].

II. Overall Study Area Wide Analysis

Table 1 shows the overall study area wide measures of effectiveness for the preferred land use scenario with/without signal coordination.

TABLE 1
Performance Improvement for the Entire Study Area

MEASURES OF EFFECTIVENESS (MOEs)	NETWORKS			
	2025 (Preferred Land Use Scenario with Existing Signal System)	2025 (Preferred Land Use Scenario with Optimized Signal System)	Change	% Change
Overall Network VMT	88,852	88,852	-	-
Overall Network VHT	18,451	17,527	- 924	- 5.0%
Overall Network Average Speed	4.82 mph	5.76 mph	+0.94	+19.5%
Overall Network Total Signal Delay in Hours	16,376	15,452	- 924	- 5.6%
Overall Network Signal Delay/ Vehicle in Seconds	134	127	- 7	- 5.2%
Overall Network Queuing Penalty	68,173	66,569	- 1,604	- 2.4%
Overall Network Unserved Vehicles	47,242	38,916	- 8,326	- 17.6%
Overall Network Performance Index	19480.5	18472.8	(+)1007.7	(+)5.2%

[1] The Minimum Split is the shortest amount of time allowed for the particular phase.
[2] The Total Split is the current split time, given in seconds. It is the amount of green, yellow, and all-red time assigned for each phase. When multiple phases are used for a movement, the Total Split is the sum of all phases. This number is given in seconds.

Corresponding environmental impacts due to signal coordination and signal system optimization are shown in **Table 2**.

TABLE 2
Environmental/ Quality of life Improvement for Entire Study Area

MEASURES OF EFFECTIVENESS (MOEs)	NETWORKS			
	2025 (Preferred Land Use Scenario with Existing Signal System)	2025 (Preferred Land Use Scenario with Optimized Signal System)	Change	% Change
Fuel Consumption for Overall Network in Gallons	20,131	19,331	- 800	- 4.0%
Overall Network Fuel Economy (Miles per Gallon)	4.4	4.6	- 0.2	- 4.5%
CO Emissions in Kg for the Entire Study Area	1407.16	1351.23	- 55.93	- 4.0%
NOx Emissions in Kg for the Entire Study Area	273.78	262.90	- 10.88	- 4.0%
VOC Emissions in Kg for the Entire Study Area	326.12	313.16	- 12.96	- 4.0%

Interpretation of the Results:

- Signal coordination and optimization throughout the study area alone can improve MOEs / performance by noticeable amount. **But it should be noted that due to high future traffic volumes, signal coordination can not be the only transportation solution in the study area. It should be accompanied by many physical transportation improvements as well throughout the study area.**

III. Corridor Analysis

Since most of the signalized intersections within the study area are along the SR1 corridor (17 of total 22), it is essential to conduct a corridor analysis for SR1 to find out impacts of signal coordination and optimization exclusively on the SR1 corridor. The performance improvement with coordinated and optimized signal system along the SR1 corridor is shown in Table **3.**

TABLE 3
Performance Improvement along SR1 Corridor

MEASURES OF EFFECTIVENESS (MOEs)	NETWORKS			
	2025 (Preferred Land Use Scenario with Existing Signal System)	**2025 (Preferred Land Use Scenario with Optimized Signal System)**	**Change**	**% Change**
Corridor VMT	56,684	56,684	-	-
Corridor VHT	6,363	5,712	- 651	- 10.2%
Corridor Average Speed	8.91 mph	9.92 mph	+ 1.01 mph	+ 11.3%
Corridor Total Signal Delay in Hours	5,093	4,442	- 651	- 12.8%
Corridor Signal Delay/ Vehicle in Seconds	55	48	- 7	- 12.7%
Corridor Queuing Penalty	49,014	43,829	- 5,185	- 10.6%
Corridor Unserved Vehicles	38,689	32,020	- 6,669	- 17.2%
Corridor Performance Index	6974.6	6359.3	(+) 614.3	(+) 8.8%

Interpretation of Analysis Results for the SR1 Corridor:

- Signal coordination and optimization along the SR1 corridor shows more than 10% improvement in almost all the measures of effectiveness. **This shows that signal coordination and optimization should be the first step towards implementing any transportation improvement alternatives.**

IV. Signalized Intersections Showing Significant Improvement in the Performance Due to Optimization.

The following intersections show major improvement in their performance due to optimization:

TABLE 4
Intersections Showing Significant Performance Improvement Due to Optimization

Signalized Intersection	NETWORKS	
	2025 (Preferred Land Use Scenario with Existing Signal System)	2025 (Preferred Land Use Scenario with Optimized Signal System)
State Route 1 & Bay Vista Road Under existing signal plan signal operates as a 3-phase split signal when it can effectively operated as a 2-phase signal.		
Intersection LOS	F	C
Int. Capacity Utilization	111.3%	111.3%
Intersection Signal Delay	244.4 sec.	31.5 sec.
State Route 1 & Rehoboth Avenue Under existing signal plan signal operates as a 3-phase split signal when it can effectively operated as a 2-phase signal.		
Intersection LOS	F	F
Int. Capacity Utilization	182.6%	182.6%
Intersection Signal Delay	302.0 sec.	254.7 sec.
State Route 1 & Darthmouth Drive Addition of protective phase for EB and WB left turn movements and reduction in the length of EB/WB through phase cycle length improves the performance of the intersection by eliminating conflicting left turn movements.		
Intersection LOS	F	F
Int. Capacity Utilization	162.5%	162.5%
Intersection Signal Delay	211.7 sec.	136.9 sec.

It should be noted that the intersection capacity utilization remains the same as the intersections are serving same traffic volumes under existing and optimized conditions. The improvement in the performance is due to proper allocation of intersection splits with most suitable phasing plan.

State Route 1 Land Use/Transportation Study

Technical Memorandum

C. Transportation Alternatives 1A and 1B Analysis

Prepared For:
Delaware Department of Transportation

Prepared By:
DMJM+HARRIS
516 East State Street
Trenton, NJ 08609

I. Introduction:

The purpose of this memorandum is to document the qualitative and quantitative improvements in the performance of the SR1 study area transportation network due to transportation alternatives 1A and 1B for the 2025 preferred land use scenario.

Transportation Improvements Under Alternatives 1A and 1B:

Major improvements reflected by traffic model:

- Diamond interchange at Five Points Intersection. (Only for Alternative 1A)
- Additional travel lanes on Rd. 275 (Plantations Road) between SR23 and Rd.274
- 4-lane SR24 section within the study area limits

Minor improvements reflected by traffic model:

- Signal system optimization and coordination.
- Intersection improvements at Rd. 275 and Postal Lane intersection, SR24 and Rd. 274 intersection, and Rd. 275 and Rd. 274 intersection.
- Cedar Grove Rd. realignment at Rd. 275 / Postal Lane / Cedar Grove Rd. intersection.
- Signalization of Rd. 275 and Postal Lane intersection, and Rd. 275 and Rd. 274 intersection.

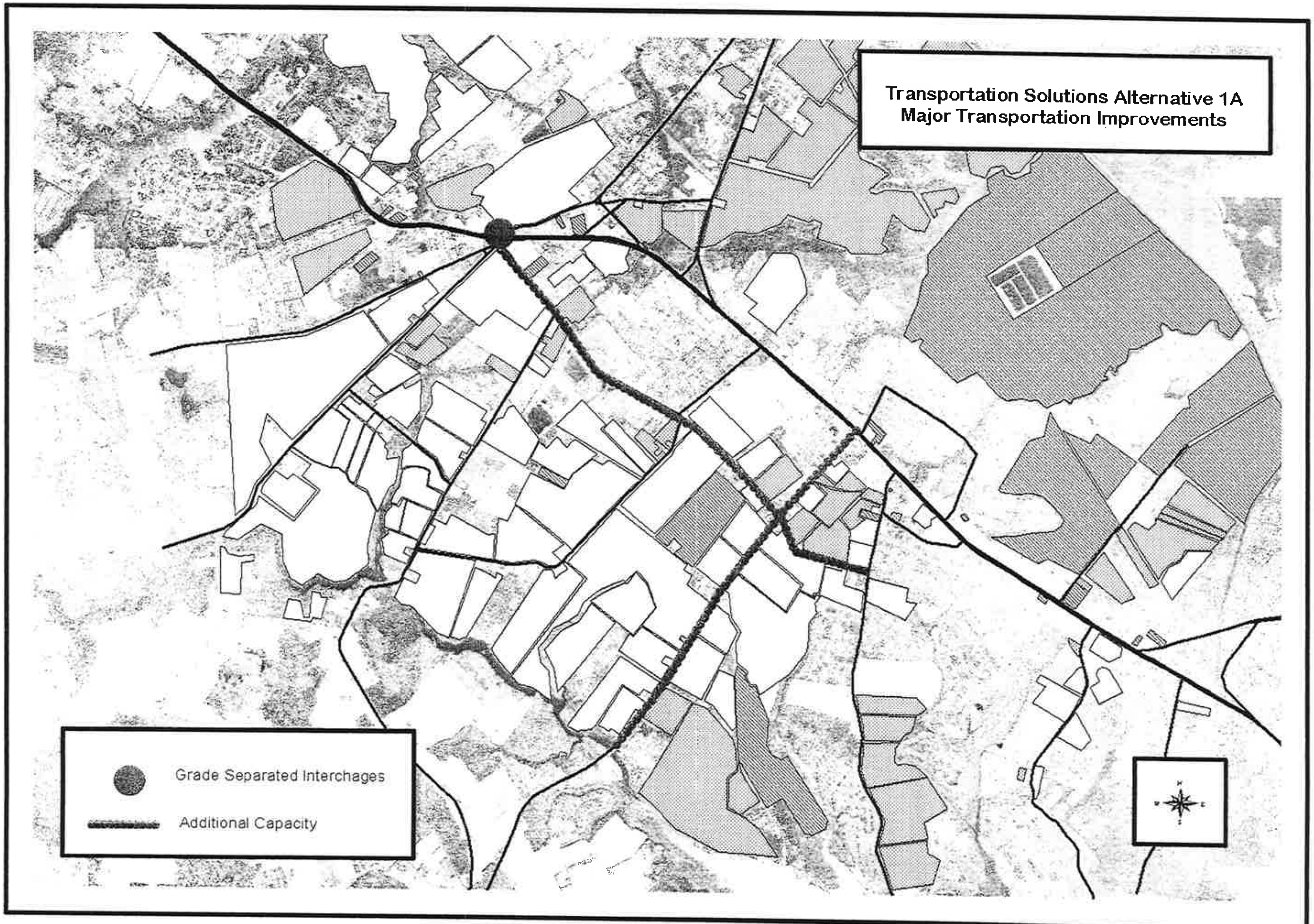
Other minor improvements considered that could not be reflected by traffic model:

- Improved traffic signs along SR1 corridor.
- Multi-use paths along SR1 corridor and bike lanes along Rd.275 corridor.
- Transit regulations regarding use of shoulders during non-peak hours.

II. Overall Study Area Wide Analysis

A. Transportation Alternative 1A:

Table 1 shows the overall study area wide measures of effectiveness for the Transportation Alternative 1A.


Transportation Solutions Alternative 1A
Major Transportation Improvements
Grade Separated Interchages
Additional Capacity

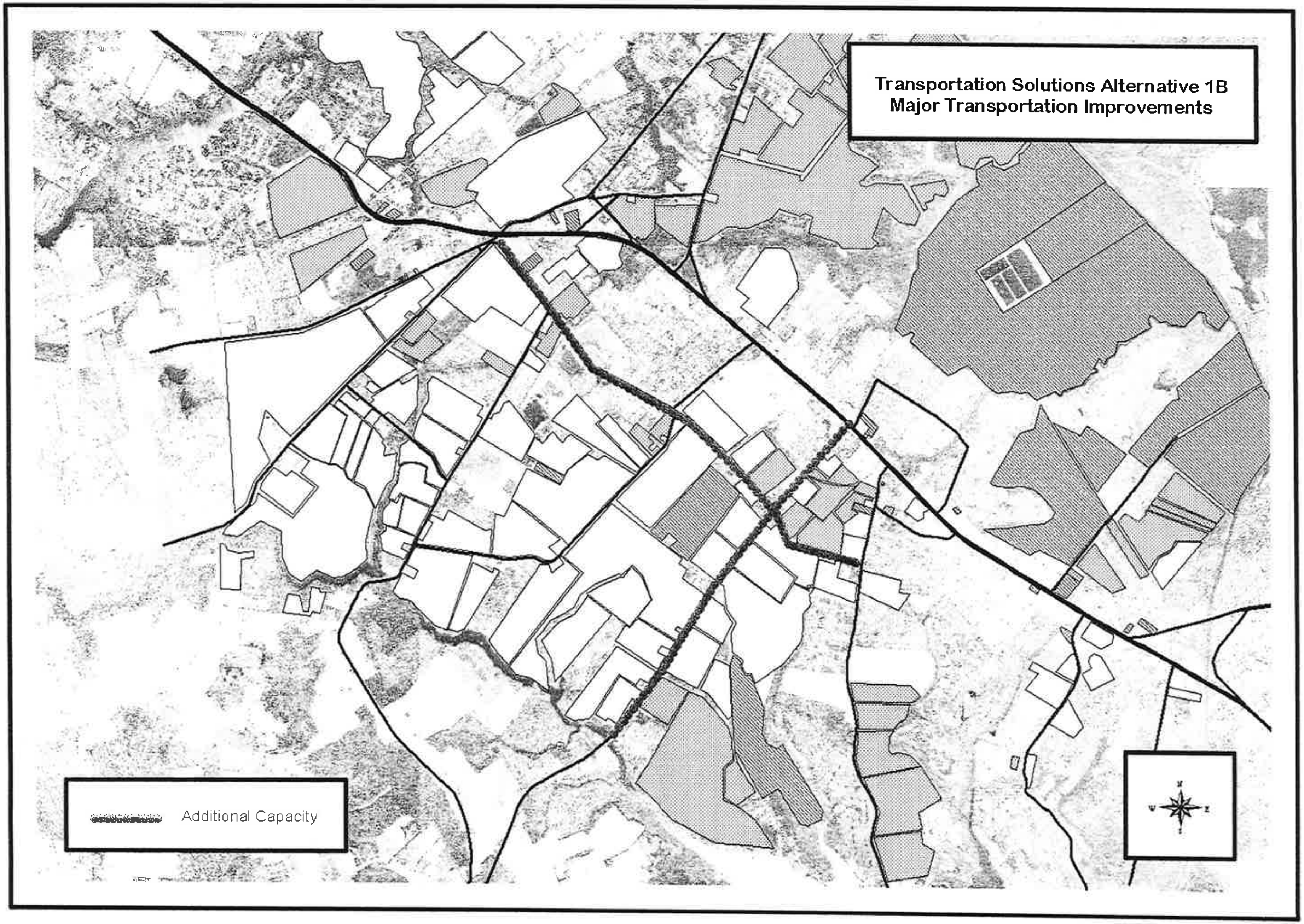

Transportation Solutions Alternative 1B
Major Transportation Improvements
Additional Capacity

TABLE 1
Performance Improvement for the Entire Study Area Under Transportation Alternative 1A

MEASURES OF EFFECTIVENESS (MOEs)	NETWORKS			
	Base Condition with No Transportation Improvements	Transportation Alternative 1A	Change	% Change
Overall Network VMT	88,852	89,919	+ 1,067	+ 1.2%
Overall Network VHT	18,451	16,416	- 2,035	- 11.0%
Overall Network Average Speed	4.82 mph	5.48 mph	+0.66	+13.7%
Overall Network Total Signal Delay in Hours	16,376	14,318	- 2,058	- 12.6%
Overall Network Signal Delay/ Vehicle in Seconds	134	114	- 20	- 14.9%
Overall Network Queuing Penalty	68,173	59,418	- 8,755	- 12.8%
Overall Network Unserved Vehicles	47,242	30,021	- 17,221	- 36.4%
Overall Network Performance Index	19480.5	16756.2	(+)2724.3	(+)14.0%
Fuel Consumption for Overall Network in Gallons	20,131	16,767	- 3,364	- 16.7%
Overall Network Fuel Economy (Miles per Gallon)	4.4	5.4	+ 1.0	+ 22.7%
Signalized intersections at LOS E/F	20 of 22	19 of 25	-	-

The following **Table 2** shows the localized effects of the transportation improvements under Alternative 1A.

TABLE 2
Performance Improvement Due to Transportation Improvements under Alternative 1A

Signalized Intersection	NETWORKS	
	Base Condition with No Transportation Improvements	**Transportation Alternative 1A**
State Route 1 & US9 / SR18 (Five Points Intersection) Improvement: Diamond Interchange		
SR1 SB Approach Delay	351.8 sec.	0 sec.
SR1 NB Approach Delay	332.1 sec.	0 sec.
Overall Intersection LOS	F	E (Ramp Signals)
Overall Intersection Delay	247.0 sec.	65.1 sec (Ramp Signals)
Rd. 275 & Postal Lane Improvement: Realignment, intersection improvement and signalization		
EB Approach Delay	269.4 sec. (Unsignalized)	113.7 sec.
Intersection Delay	602. 6 sec. (Unsignalized)	96.0 sec.
Rd. 275 & SR24 Improvement: Intersection improvement, Additional Lanes on Rd.275 and SR24		
Intersection Delay	256.6 sec.	134.2 sec.
Rd. 275 & Rd. 274 Improvement: Intersection improvement and signalization		
Overall Intersection LOS	F (Unsignalized)	C
Overall Intersection Delay	285.1 sec.	24.1 sec.
State Route 1 & Bay Vista Road Improvement: Signal Optimization		
Intersection LOS	F	C
Intersection Signal Delay	244.4 sec.	31.5 sec.
State Route 1 & Rehoboth Avenue Improvement: Signal Optimization		
Intersection Signal Delay	302.0 sec.	254.7 sec.
State Route 1 & Darthmouth Drive Improvement: Signal Optimization		
Intersection Signal Delay	211.7 sec.	123.7 sec.
Road 275 (Plantations Road) Corridor		
Corridor VMT in miles	5913	7582
Corridor VHT in hours	796	324
Avg. corridor delay per vehicle	196 sec.	41 sec.
State Route 24 Corridor		
Corridor VMT in miles	6252	6157
Corridor VHT in hours	891	532
Avg. corridor delay per vehicle	211 sec.	116 sec

Interpretation of the Results:

- Although MOE results show noticeable improvement in the performance of the network, the impacts of transportation improvements are more significant only locally where the actual improvements have been proposed. Overall network wide results do not show betterment in the MOEs that is significant enough to improve overall network performance. This can be seen by the number of intersection that would still be operating at LOS E/F under the Transportation Alternative 1A (19 of 25). The results of traffic analysis also show that improvements along Rd. 275 do not have much impact on the performance of the SR1 corridor.

- Some of the intersections where improvements have been proposed under Alternative 1A are still failing although they show significant improvement in intersection delay time.

B. Transportation Alternative 1B:

Table 3 shows the overall study area wide measures of effectiveness for the Transportation Alternative 1B.

TABLE 3
Performance Improvement for the Entire Study Area Under Transportation Alternative 1B

MEASURES OF EFFECTIVENESS (MOEs)	NETWORKS			
	Base Condition with No Transportation Improvements	Transportation Alternative 1B	Change	% Change
Overall Network VMT	88,852	89,390	+ 538	+ 0.6%
Overall Network VHT	18,451	16,813	- 1,638	- 8.9%
Overall Network Average Speed	4.82 mph	5.31 mph	+0.49	+10.2%
Overall Network Total Signal Delay in Hours	16,376	14,688	- 1,688	- 10.3%
Overall Network Signal Delay/ Vehicle in Seconds	134	120	- 14	- 10.5%
Overall Network Queuing Penalty	68,173	62,228	- 5,945	- 8.7%
Overall Network Unserved Vehicles	47,242	34,696	- 12,546	- 26.6%
Overall Network Performance Index	19480.5	17220.7	(+)2259.8	(+)11.6%
Fuel Consumption for Overall Network in Gallons	20,131	17,047	- 3,084	- 15.3%
Overall Network Fuel Economy (Miles per Gallon)	4.4	5.2	+ 0.8	+ 18.2%
Signalized intersections at LOS E/F	20 of 22	19 of 25	-	-

The following **Table 4** shows the localized effects of the transportation improvements under Alternative 1B.

TABLE 4
Performance Improvement Due to Transportation Improvements under Alternative 1B

Signalized Intersection	**NETWORKS**	
	Base Condition with No Transportation Improvements	**Transportation Alternative 1B**
Rd. 275 & Postal Lane Improvement: Realignment, intersection improvement and signalization		
Intersection Delay	602. 6 sec. (Unsignalized)	84.8 sec.
Rd. 275 & SR24 Improvement: Intersection improvement, Additional Lanes on Rd.275 and SR24		
Intersection Delay	256.6 sec.	125.4 sec.
Rd. 275 & Rd. 274 Improvement: Intersection improvement and signalization		
Overall Intersection LOS	F (Unsignalized)	C
Overall Intersection Delay	285.1 sec.	21.8 sec.
State Route 1 & Bay Vista Road Improvement: Signal Optimization		
Intersection LOS	F	C
Intersection Signal Delay	244.4 sec.	31.5 sec.
State Route 1 & Rehoboth Avenue Improvement: Signal Optimization		
Intersection Signal Delay	302.0 sec.	254.7 sec.
State Route 1 & Darthmouth Drive Improvement: Signal Optimization		
Intersection Signal Delay	211.7 sec.	123.7 sec.
Road 275 (Plantations Road) Corridor		
Corridor VMT in miles	5913	6771
Corridor VHT in hours	796	266
Avg. corridor delay per vehicle	196 sec.	35 sec.
State Route 24 Corridor		
Corridor VMT in miles	6252	6140
Corridor VHT in hours	891	510
Avg. corridor delay per vehicle	211 sec.	110 sec.

Interpretation of the Results:

- Same as in Alternative 1A

INFERENCE:

- Based on network wide performance measures, Alternative 1A (with diamond interchange at Five Points) is better than alternative 1B.
- These alternatives show localized improvements. Neither of these alternatives creates significant overall improvement in the performance of the overall study area (and especially the SR1 corridor). Thus, these alternatives should be combined with other possible alternatives for achieving better performance.
- Addition of only one lane in southbound direction along Rd. 275 is optimum, as additional lane increments along this corridor in both directions do not show much further improvement in the performance of the corridor.

State Route 1 Land Use/Transportation Study

Technical Memorandum

D. Transportation Alternative 2 Analysis

Prepared For:
Delaware Department of Transportation

Prepared By:
DMJM+HARRIS
516 East State Street
Trenton, NJ 08609

I. Introduction:

The purpose of this memorandum is to document the qualitative and quantitative improvements in the performance of the SR1 study area transportation network due to transportation alternative 2 for the 2025 preferred land use scenario.

Transportation Improvements Under Alternative 2:

Major improvements reflected by traffic model:

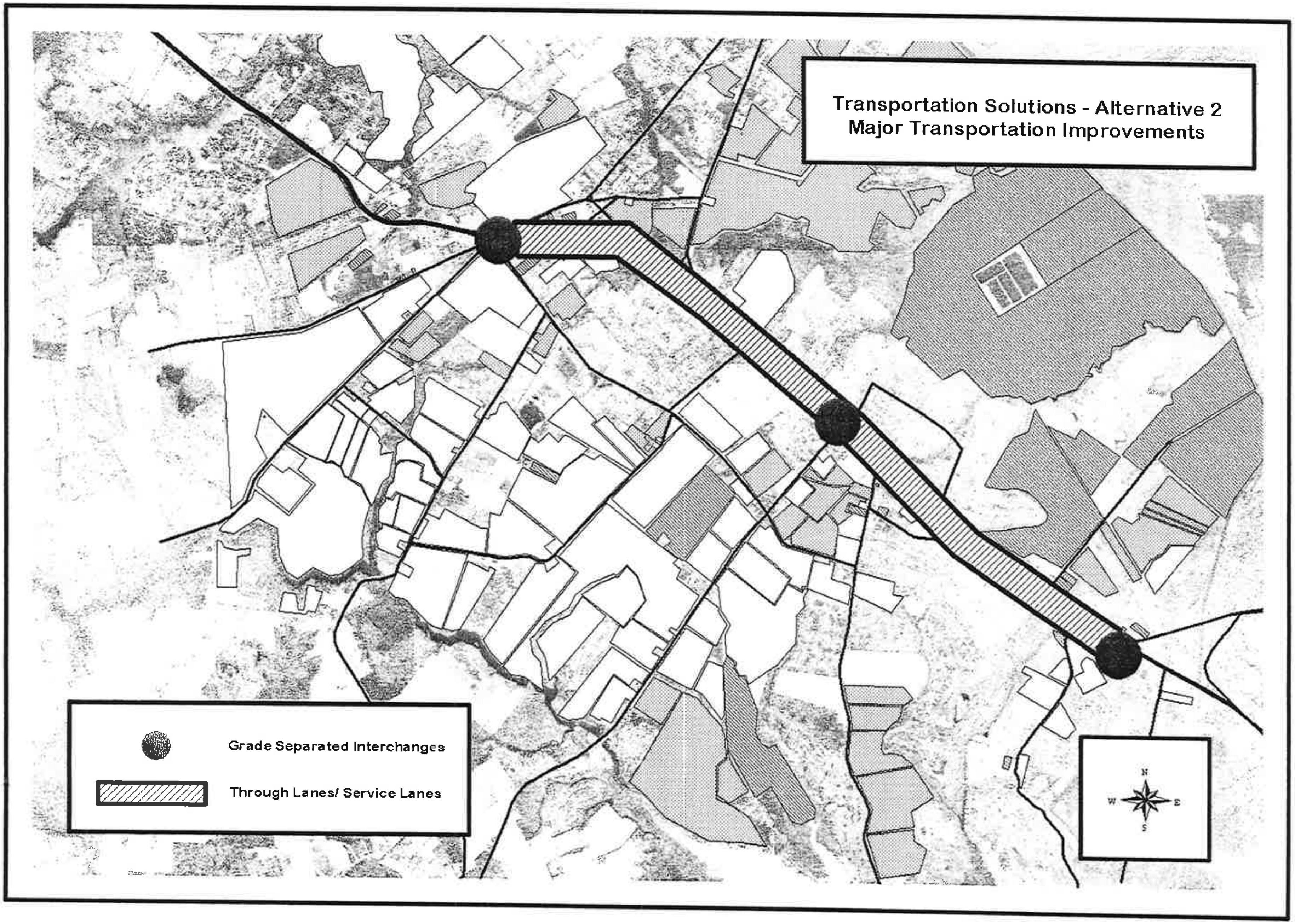
- Diamond interchanges at Five Points intersection, SR1/SR24 intersection, and SR1/Rehoboth Ave. intersection.
- SR1 section between Five Points and Rehoboth Avenue with separate express lanes (without any traffic signals) and one-way local lanes.
- SR24 corridor with 4-lane section

Minor improvements reflected by traffic model:

- Signal system optimization and coordination.
- Intersection improvements at Rd. 275 and Postal Lane intersection, SR24 and Rd. 274 intersection, and Rd. 275 and Rd. 274 intersection.
- Cedar Grove Rd. realignment at Rd. 275 / Postal Lane / Cedar Grove Rd. intersection.
- Signalization of Rd. 275 and Postal Lane intersection, and Rd. 275 and Rd. 274 intersection.

Other minor improvements considered that could not be reflected by traffic model:

- Improved traffic signs along SR1 corridor.
- Multi-use paths along SR1 corridor and bike lanes along Rd.275 corridor.
- Transit regulations regarding use of shoulders during non-peak hours.


Transportation Solutions - Alternative 2
Major Transportation Improvements
Grade Separated Interchanges
Through Lanes/ Service Lanes
N
W
E
S

II. Overall Study Area Wide Analysis

A. Transportation Alternative 2:

Table 1 shows the overall study area wide measures of effectiveness for the Transportation Alternative 2.

TABLE 1
Performance Change for the Entire Study Area Under Transportation Alternative 2

MEASURES OF EFFECTIVENESS (MOEs)	NETWORKS			
	Base Condition with No Transportation Improvements	Transportation Alternative 2	Change	% Change
Overall Network VMT	88,852	91,916	+ 3,064	+ 3.4%
Overall Network VHT	18,451	19,251	+ 800	+ 4.3%
Overall Network Average Speed	4.82 mph	4.77 mph	- 0.05	- 1.0%
Overall Network Total Signal Delay in Hours	16,376	16,862	+ 486	+ 3.0%
Overall Network Signal Delay/ Vehicle in Seconds	134	139	+ 5	+ 3.7%
Overall Network Queuing Penalty	68,173	57,984	- 10,189	- 14.9%
Overall Network Unserved Vehicles	47,242	36,453	- 10,789	- 22.8%
Overall Network Performance Index	19480.5	19324.9	(+)155.6	(+)0.8%
Fuel Consumption for Overall Network in Gallons	20,131	18,435	- 1,696	- 8.4%
Overall Network Fuel Economy (Miles per Gallon)	4.4	5.0	+ 0.6	+ 13.6%
Signalized intersections at LOS E/F	20 of 22	24 of 36	-	-

Interpretation of the analysis results:

The above MOE table shows that the Transportation Alternative 2 reflects negligible overall study area performance improvement (as indicated by performance index). In fact, some of the MOEs actually deteriorate compared to the transportation base alternative (with no improvements). The following bullets indicate reasons behind the changes in MOEs associated with Transportation Alternative 2.

- Overall network VMT under Alternative 2 has been increased slightly compared to transportation base condition due to the following reasons.

  a) The local lanes along SR1 are one-way and separated from express lanes altogether except at the diamond interchanges.
  b) This results in additional circulation for significant number of local vehicles as left turn and through movements from side streets as well as left turn movement from SR1 cannot happen due to Alternative 2 lane configuration.
  c) This significant amount of additional circulation of traffic results in additional VMT for the Alternative 2.

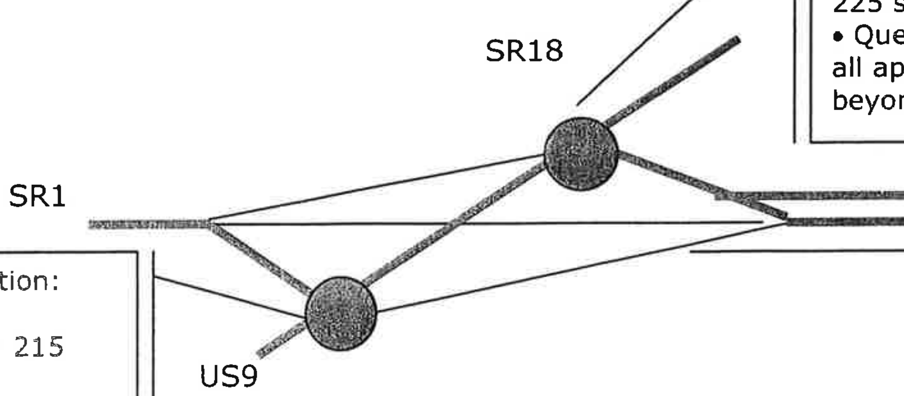
- Overall network VHT under Alternative 2 has been increased slightly compared to transportation base condition due to the following reasons:

  a) Although express lanes are free flowing, local lane traffic is beyond the lane capacity mainly due to one-way circulation issues.
  b) Traffic at the SR1/US9 and SR1/SR24 diamond interchanges is 2 to 3 times more than the capacity of these interchanges. These interchanges fail very badly greatly impacting the performance of local lanes and slip ramps approaching/leaving these interchanges and have reverberating delay effects on the performance of the signalized intersections in the vicinity.

  Examples:

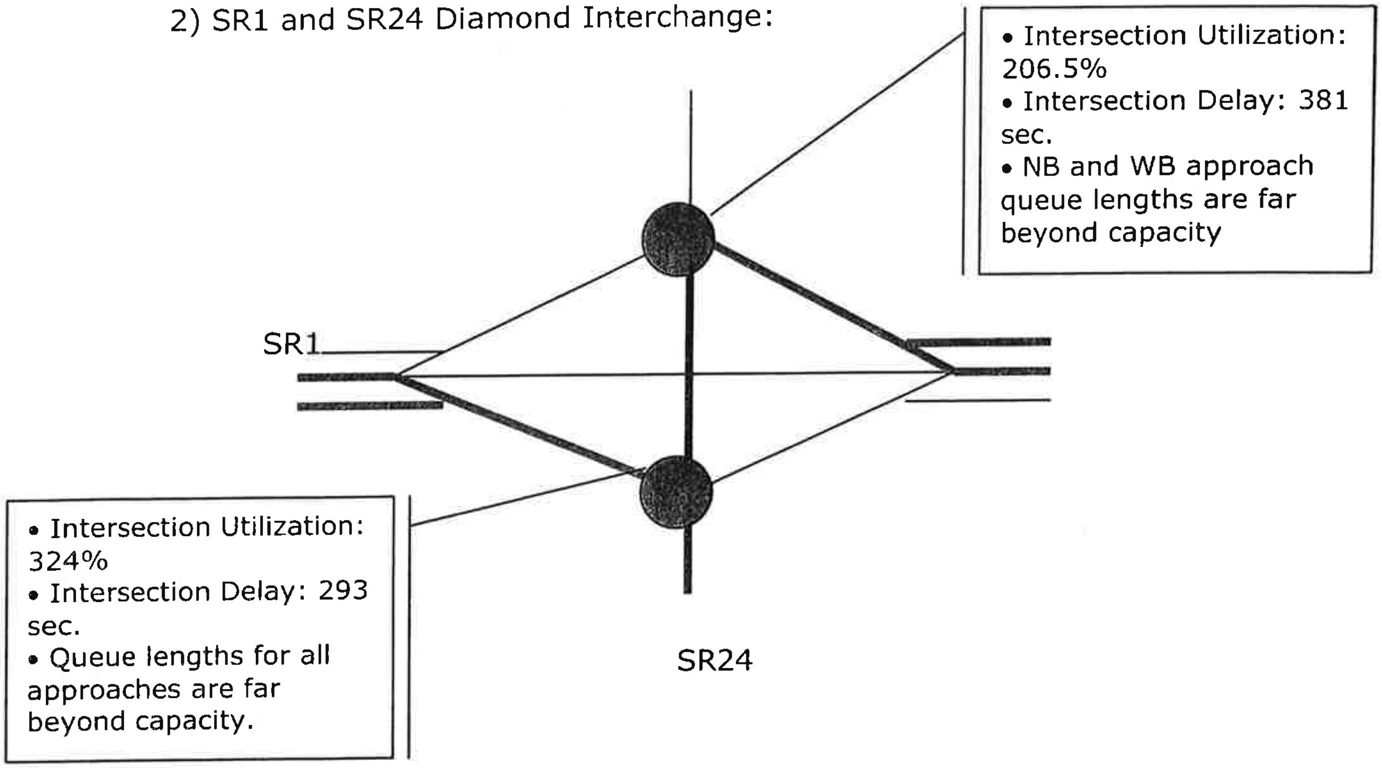
  1) SR1 and SR18/US9 Diamond Interchange:

- Intersection Utilization: 190.7%
- Intersection Delay: 225 sec.
- Queue lengths for all approaches are far beyond capacity.



- Intersection Utilization: 271.9%
- Intersection Delay: 215 sec.
- Queue lengths for all approaches are far beyond capacity.

2) SR1 and SR24 Diamond Interchange:



- Although the numerical values of overall network total signal delay (in hours) and signal delay per vehicle (in sec.) has been slightly increased in the Alternative 2, it should be noted that number of signalized intersections in this alternative have also been increased to 36 compared to 22 in the transportation base alternative. Considering this fact, these MOEs indicate significant improvements at individual signalized intersections in the Alternative 2 (which is also reflected by less proportion of failing signalized intersections: 24 of 36.)

- The overall network queuing penalty has been reduced considerably because of the separation of local and through traffic along SR1. The diamond interchange systems (including approaches, slip ramps and local lanes) experience extensive concentrated impacts related to queuing issues.

III. Localized Performance Improvements/Deteriorations:

The following tables 2 & 3 show localized improvements and deterioration in the signalized intersection performance due to transportation alternative 2.

TABLE 2
Performance Betterment Due to Transportation Improvements under Alternative 2

Signalized Intersection	NETWORKS	
	Base Condition with No Transportation Improvements	**Transportation Alternative 1A**
State Route 1 & US9 / SR18 (Five Points Intersection) Improvement: Diamond Interchange		
SR1 SB Approach Delay	351.8 sec.	0 sec.
SR1 NB Approach Delay	332.1 sec.	0 sec.
Overall Intersection LOS	F	F (Ramp Signals)
Overall Intersection Delay	247.0 sec.	225.0 sec (Ramp Signals)
Rd. 275 & Postal Lane Improvement: Realignment, intersection improvement and signalization		
Intersection Delay	602. 6 sec. (Unsignalized)	99.2 sec.
Rd. 275 & SR24 Improvement: Intersection improvement, Additional Lanes on Rd.275 and SR24		
Intersection Delay	256.6 sec.	160.8 sec.
Rd. 275 & Rd. 274 Improvement: Intersection improvement and signalization		
Overall Intersection LOS	F (Unsignalized)	B
Overall Intersection Delay	285.1 sec.	13.8 sec.
State Route 1 & Bay Vista Road Improvement: Signal Optimization		
Intersection LOS	F	C
Intersection Signal Delay	244.4 sec.	31.5 sec.
State Route 1 & Rehoboth Avenue Improvement: Diamond interchange, Signal location realignment & signal optimization		
Intersection LOS	F	C
Intersection Signal Delay	302.0 sec.	32.1 sec.

TABLE 3
Performance Improvements/Deteriorations Due to Transportation Improvements under Alternative 2

Signalized Intersection Location	Signalized Intersection LOS (Transportation Base Alternative)	Signalized Intersection LOS (Transportation Alternative 2)	
		Southbound	Northbound
SR1 and Westcoats Road	F (93.4 sec)	-	B (15.1 sec)
SR1 and Darthmouth Drive	F (211.7 sec)	C (28.0 sec)	A (7.0 sec)
SR1 and Postal Lane	**F (93.6 sec)**	E (70.0 sec)	**F (123.9 sec)**
SR1 and Midway Shopping Center	**F (108.4 sec)**	A (9.9 sec)	**F (111.9 sec)**
SR1 and SR24	**F (108.2 sec)**	**F (293.2 sec)**	**F (381.9 sec)**
SR1 and Rehoboth Mall	**C (25.4 sec)**	**F (103.4 sec)**	-
SR1 and Road 274	**F (98.5 sec)**	**F (159.7 sec)**	-
SR1 and Munchy Branch Road	F (117.9 sec)	F (102.0 sec)	C (27.7 sec)
SR1 and Camelot	F (179.2 sec)	F(153.0 sec)	C (26.2 sec)
SR1 and K-Mart	**F (101.2 sec)**	**F (119.2 sec)**	**F (169.0 sec)**
SR1 and Road 273	**F (88.6 sec)**	**F(140.6 sec)**	**F (144.9 sec)**

<u>INFERENCES:</u>

- **Local traffic circulation issues, related to roadway configuration under Alternative 2, add significant traffic volumes on NB one-way local lane and SB one-way local lane. Due to this additional traffic, local lane volumes exceed capacity resulting in delays and long vehicle queues at signalized intersections.**

  The following analysis outputs show improvement in the performance of local lanes (except at the interchanges) if one additional local lane is available in each direction i.e. four lanes each (two express and two local lanes) in SB and NB directions.

TABLE 4

Local Lane Performance Improvement for SR1 Corridor with an Additional One-Way Local Lane in Southbound Direction

MEASURES OF EFFECTIVENESS (MOEs)	NETWORKS			
	Transportation Alternative 2 (1 one-way local lane in SB direction)	Transportation Alternative 2 (2 one-way local lanes in SB direction)	Change	% Change
Overall Network VMT	9,693	9,693	-	-
Overall Network VHT	1111	413	- 698	- 62.8%
Overall Network Average Speed	8.7 mph	23.5 mph	+ 14.8	+170.1%
Overall Network Total Signal Delay in Hours	787	90	- 697	- 88.6%
Overall Network Signal Delay/ Vehicle in Seconds	93	11	- 82	- 88.2%
Overall Network Queuing Penalty	10,289	1,996	- 8,293	- 80.6%
Overall Network Unserved Vehicles	3,372	121	- 3,251	- 96.4%
Overall Network Performance Index	1182.8	186.7	(+)996.1	(+)84.2%
Fuel Consumption for Overall Network in Gallons	1194	547	- 647	- 54.2%
Overall Network Fuel Economy (Miles per Gallon)	8.1	17.7	+ 9.6	+118.5%
Signalized intersections at LOS E/F	9 of 11	0 of 11	-	-

TABLE 5

Local Lane Performance Improvement for SR1 Corridor with an Additional One-Way Local Lane in Northbound Direction

MEASURES OF EFFECTIVENESS (MOEs)	NETWORKS			
	Transportation Alternative 2 (1 one-way local lane in NB direction)	Transportation Alternative 2 (2 one-way local lanes in NB direction)	Change	% Change
Overall Network VMT	7,974	7,974	-	-
Overall Network VHT	644	353	- 291	- 45.1%
Overall Network Average Speed	12.4 mph	22.6 mph	+ 10.2	+ 82.3%
Overall Network Total Signal Delay in Hours	378	88	- 290	- 76.7%
Overall Network Signal Delay/ Vehicle in Seconds	44	10	- 34	- 77.2%
Overall Network Queuing Penalty	5,358	1,642	- 3,716	- 69.4%
Overall Network Unserved Vehicles	3,372	121	- 3,251	- 96.4%
Overall Network Performance Index	596.4	161.8	(+)434.6	(+)72.9%
Fuel Consumption for Overall Network in Gallons	744	449	- 295	- 39.7%
Overall Network Fuel Economy (Miles per Gallon)	10.7	17.7	+ 7.0	+ 65.4%
Signalized intersections at LOS E/F	5 of 9	1 of 9	-	-

- **The capacity issues at the diamond interchanges mainly hamper the effectiveness of separating through and local traffic under this transportation alternative. This alternative can work effectively only if sufficient capacity is available at these diamond interchanges.**

  For providing necessary capacity at these diamond interchanges, there should be at least 6-7 lanes on the overpass, 3-4 lanes on the ramps approaching signalized intersections, 2 lanes on slip ramps merging into express lanes, and significantly long acceleration /decelaration lanes along SR1 express corridor to swiftly accommodate merging/ diverging traffic to/from local lanes.

  Signalized intersections at the diamond interchanges fail badly as shown earlier in the examples.

  The following table shows performance of merge and diverge ramp junctions. It should be noted that although diverge ramp junction LOS is within acceptable range, the junctions may have operational issues due to backup effects of signalized intersections at the interchange:

TABLE 6

Ramp Junction LOS under Alternative 2

Locations	Diverge Ramp Junction		Merge Ramp Junction	
	Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS
Five Points Interchange				
Southbound	25.7	C	N.A.	F
Northbound	22.6	C	N.A.	F
SR24 Interchange				
Southbound	33.4	D	N.A.	F
Northbound	N.A.	F	12.5	B
Rehoboth Avenue Interchange				
Southbound	N.A.	F	24.3	C
Northbound	29.5	D	N.A.	F

State Route 1 Land Use/Transportation Study

Technical Memorandum

E. Transportation Alternative 3A Analysis

Prepared For:
Delaware Department of Transportation

Prepared By:
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516 East State Street
Trenton, NJ 08609

I. INTRODUCTION:

The purpose of this memorandum is to document the qualitative and quantitative improvements in the performance of the SR1 study area transportation network due to transportation alternative 3A (with three sub-options 3A1, 3A2, and 3A3) for the 2025 preferred land use scenario.

Transportation Improvements Under Alternative 3A:

Major improvements reflected by traffic model:

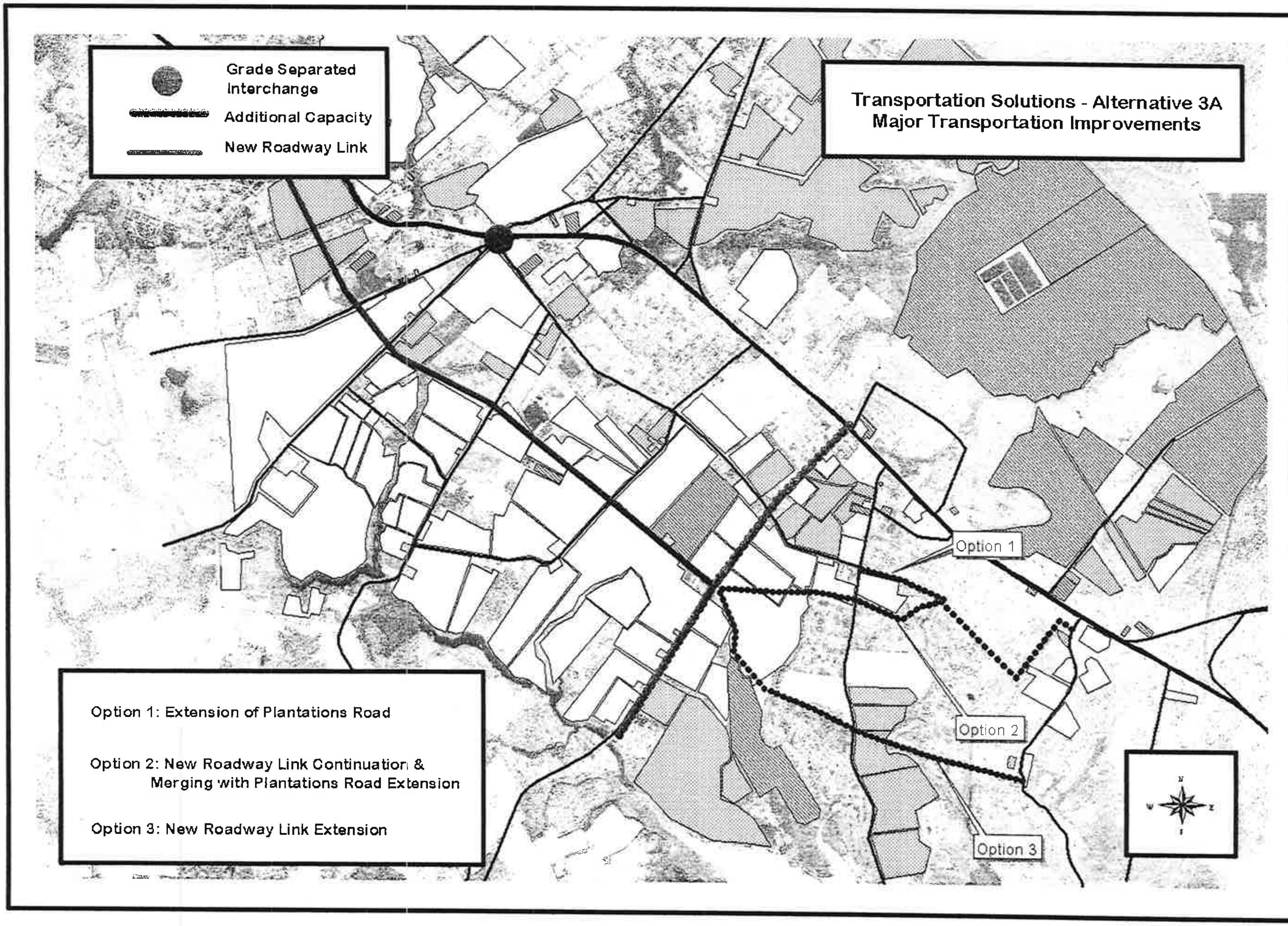
- Diamond interchange at Five Points intersection.
- Limited bypass alignment (between north of Five Points and SR24) with signalized intersections.
- SR24 corridor with 4-lane section.
- Option 3A1: Road 275 (Plantations Road) extension up to Road 273.
- Option 3A2: Road 275 (Plantations Road) extension up to Road 273 with direct connection from new bypass alignment.
- Option 3A3: Continuation of limited bypass alignment between SR24 and Rd. 273.

Minor improvements reflected by traffic model:

- Signal system optimization and coordination.
- Intersection improvements at Rd. 275 and Postal Lane intersection, SR24 and Rd. 274 intersection, and Rd. 275 and Rd. 274 intersection.
- Cedar Grove Rd. realignment at Rd. 275 / Postal Lane / Cedar Grove Rd. intersection.
- Signalization of Rd. 275 and Postal Lane intersection, and Rd. 275 and Rd. 274 intersection.

Other minor improvements considered that could not be reflected by traffic model:

- Improved traffic signs along SR1 corridor.
- Multi-use paths along SR1 corridor and bike lanes along Rd.275 corridor.
- Transit regulations regarding use of shoulders during non-peak hours.



Transportation Solutions - Alternative 3A
Major Transportation Improvements
Grade Separated Interchange
Additional Capacity
New Roadway Link
Option 1
Option 2
Option 3
Option 1: Extension of Plantations Road
Option 2: New Roadway Link Continuation & Merging with Plantations Road Extension
Option 3: New Roadway Link Extension

II. TRANSPORTATION ALTERNATIVE 3A1:

A. Overall Study Area Wide Analysis

Table 1 shows the overall study area wide measures of effectiveness for the Transportation Alternative 3A1.

TABLE 1
Performance Change for the Entire Study Area Under Transportation Alternative 3A1

MEASURES OF EFFECTIVENESS (MOEs)	NETWORKS			
	Base Condition with No Transportation Improvements	Transportation Alternative 3A1	Change	% Change
Overall Network VMT	88,852	96,355	+ 7,503	+ 8.4%
Overall Network VHT	18,451	12,651	- 5,800	- 31.4%
Overall Network Average Speed	4.82 mph	7.62 mph	+ 2.8	+ 58.1%
Overall Network Total Signal Delay in Hours	16,376	9,729	- 6,647	- 40.6%
Overall Network Signal Delay/ Vehicle in Seconds	134	80	- 54	- 40.3%
Overall Network Queuing Penalty	68,173	51,082	- 17,091	- 25.1%
Overall Network Unserved Vehicles	47,242	21,803	- 25,439	- 53.8%
Overall Network Performance Index	19480.5	11758.0	(+)7722.5	(+)39.6%
Fuel Consumption for Overall Network in Gallons	20,131	12,512	- 7,619	- 37.8%
Overall Network Fuel Economy (Miles per Gallon)	4.4	7.7	+ 3.3	+ 75.0%
Signalized intersections at LOS E/F	20 of 22	14 of 32	-	-

Interpretation of the analysis results:

- The MOE comparisons show significant improvement in the overall network performance under alternative 3A1. The primary reason behind this improvement is that the new bypass alignment could shift a sizable amount of traffic from SR1.

- The new bypass alignment would provide a more direct connection between southbound SR1 and US9 as well as SR24. Thus, southbound traffic on SR1 approaching the study area and heading towards US9 or SR24 would not be required to use SR1 within the study area at all. It would also be applicable in the reverse direction.

- Northbound local traffic, from west of SR1, can use the new bypass alignment instead of having to access SR1 within the study area. It is also applicable for southbound traffic on SR1 with local destinations west of SR1.

- The new bypass alignment + section of SR24 between the bypass and Rd. 275 + Rd. 275 extension up to Rd. 273 can serve as a limited bypass to SR1 between Five Points and Rehoboth entrance.

- The new bypass alignment can also serve as an alternative to Rd. 275 for inter activity center trips on the west side of SR1.

- As a result, study area traffic volumes would have multiple travel options and would be divided between SR1 corridor, Rd. 275 corridor and new bypass corridor resulting in the overall performance improvement. It also partially eliminates the need (under existing roadway configuration) for the local traffic west of SR1, to access SR1 segments within the study area.

B. Corridor Analysis

It is important to analyze the improvement in the performance of the SR1 corridor individually due to transportation alternative 3A1. The performance improvement along the SR1 corridor is shown in **Table 2.**

TABLE 2
Performance Improvement along SR1 Corridor

MEASURES OF EFFECTIVENESS (MOEs)	NETWORKS			
	Base Condition with No Transportation Improvements	Transportation Alternative 3A1	Change	% Change
Corridor VMT	56,684	51,850	- 4,834	- 8.5%
Corridor VHT	6,363	4,344	- 2,019	- 31.7%
Corridor Average Speed	8.91 mph	12.0 mph	+3.09 mph	+ 34.7%
Corridor Total Signal Delay in Hours	5,093	2,584	- 2,509	- 49.3%
Corridor Signal Delay/ Vehicle in Seconds	55	29	- 26	- 47.3%
Corridor Queuing Penalty	49,014	29,962	-19,052	- 38.9%
Corridor Unserved Vehicles	38,689	14,329	-24,360	- 63.0%
Corridor Performance Index	6974.6	3729.9	(+) 3244.7	(+) 46.5%
Corridor Fuel Consumption in Gallons	7,813	4,761	- 3,052	- 39.0%
Corridor Fuel Economy (Miles per Gallon)	7.2	11.3	+ 4.1	+ 57.0%
Signalized intersections at LOS E/F	16 of 17	9 of 17	-	-

Interpretation of Analysis Results for the SR1 Corridor:

- The SR1 corridor shows a major improvement in performance due to significant shifts in the amount of traffic to the proposed alternative bypass alignment within the study area. Due to this alternative alignment, local traffic on the west side of SR1 would no longer be required to access SR 1 for all trips.

C. Localized Performance Improvements:

Table 3 shows localized improvements in the performance of signalized intersections along SR1 between Five Points and Rd.273. **Table 4** shows improvements at some other locations due to major and minor improvements proposed under the transportation alternative 3A1.

TABLE 3

Transportation Alternative 3A1: Performance Improvement at Signalized Intersections along SR1 between Five Points and Road 273

Signalized Intersection Location	Signalized Intersection LOS (Transportation Base Alternative)	Signalized Intersection LOS (Transportation Alternative 3A1)
SR1 and Westcoats Road	F (93.4 sec)	B (14.4 sec)
SR1 and Darthmouth Drive	F (211.7 sec)	F (94.6 sec)
SR1 and Postal Lane	F (93.6 sec)	D (49.2 sec)
SR1 and Midway Shopping Center	F (108.4 sec)	D (54.2 sec)
SR1 and SR24	F (108.2 sec)	F (102.5 sec)
SR1 and Rehoboth Mall	C (25.4 sec)	B (10.3 sec)
SR1 and Road 274	F (98.5 sec)	D (41.4 sec)
SR1 and Munchy Branch Road	F (117.9 sec)	F (103.5 sec)
SR1 and Camelot	F (179.2 sec)	F (156.8 sec)
SR1 and K-Mart	F (101.2 sec)	E (61.5 sec)
SR1 and Road 273	F (88.6 sec)	D (46.4 sec)

TABLE 4
Performance Improvement Due to Transportation Improvements under Alternative 3A1

Signalized Intersection	NETWORKS	
	Base Condition with No Transportation Improvements	Transportation Alternative 3A1
State Route 1 & US9 / SR18 (Five Points Intersection) Improvement: Diamond Interchange		
SR1 SB Approach Delay	351.8 sec.	0 sec.
SR1 NB Approach Delay	332.1 sec.	0 sec.
Intersection LOS	F	C / F (Ramp Signals)
Intersection Delay	247.0 sec.	22.8 / 165.2 sec (Ramp Signals)
Rd. 275 & Postal Lane Improvement: Realignment, intersection improvement and signalization		
Intersection LOS	F	E
Intersection Delay	602. 6 sec. (Unsignalized)	59.8 sec.
Rd. 275 & SR24 Improvement: Intersection improvement, Additional Lanes on Rd.275 and SR24		
Intersection Delay	256.6 sec.	160.8 sec.
Rd. 275 & Rd. 274 Improvement: Intersection improvement and signalization		
Overall Intersection Delay	285.1 sec.	140.9 sec.
State Route 1 & Bay Vista Road Improvement: Signal Optimization		
Intersection LOS	F	C
Intersection Signal Delay	244.4 sec.	28.9 sec.

Table 5 shows performance of merge and diverge ramp junctions at the Five Points diamond interchange.

TABLE 5

Five Points Diamond Interchange
Ramp Junction LOS under Alternative 3A1

Locations	Diverge Ramp Junction		Merge Ramp Junction	
	Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS
Five Points Diamond Interchange				
Southbound	24.1	C	21.1	C
Northbound	27.8	C	28.3	D

III. TRANSPORTATION ALTERNATIVE 3A2:

A. Overall Study Area Wide Analysis

Table 6 shows the overall study area wide measures of effectiveness for the Transportation Alternative 3A2.

TABLE 6
Performance Change for the Entire Study Area Under Transportation Alternative 3A2

MEASURES OF EFFECTIVENESS (MOEs)	NETWORKS			
	Base Condition with No Transportation Improvements	Transportation Alternative 3A2	Change	% Change
Overall Network VMT	88,852	96,057	+ 7,205	+ 8.1%
Overall Network VHT	18,451	12,471	- 5,980	- 32.4%
Overall Network Average Speed	4.82 mph	7.70 mph	+ 2.88	+ 59.8%
Overall Network Total Signal Delay in Hours	16,376	9,543	- 6,833	- 41.7%
Overall Network Signal Delay/ Vehicle in Seconds	134	78	- 56	- 41.8%
Overall Network Queuing Penalty	68,173	48,276	- 19,897	- 29.2%
Overall Network Unserved Vehicles	47,242	19,983	- 25,439	- 53.8%
Overall Network Performance Index	19480.5	11484.1	(+)7996.4	(+)41.0%
Fuel Consumption for Overall Network in Gallons	20,131	12,325	- 7,806	- 38.8%
Overall Network Fuel Economy (Miles per Gallon)	4.4	7.8	+ 3.4	+ 77.3%
Signalized intersections at	20 of 22	15 of 34	-	-

LOS E/F				

Interpretation of the analysis results:

Transportation alternative 3A2 shows similar improvements as that of Alternative 3A1 (slightly better MOE outputs than 3A1).

Advantage of Alternative 3A2 over 3A1:

Due to continuation of the new bypass alignment up to the Rd. 275 extension, bypassing vehicles are no longer required to make a left turn on SR 24 from the new bypass link and then a right turn on Rd. 275 extension. The number of vehicles making these movements have been significantly reduced due to Alt. 3A2 improving the performance of these two intersections (it should be noted that despite performance improvement compared to 3A1, these intersections are still failing).

Disadvantage of Alternative 3A2 over 3A1:

The continuation of the new bypass link up to the Rd. 275 extension would make the bypass link bisect a proposed activity center location near the school. The planning for the roadway alignment and the planning for this new activity center/village should be coordinated and the roadway buffered so as to minimize any adverse effects of this roadway on this development.

Apart from the above, the intersection of the new bypass link and SR 24 would be either a 5-leg intersection or combination of two closely situated clustered signalized intersections. This will adversely impact the performance of one of the approaches to the proposed activity center.

B. Corridor Analysis

The performance improvement due to Alternative 3A2 along the SR1 corridor is shown in **Table 7.**

TABLE 7
Performance Improvement along SR1 Corridor
Due to Alternative 3A2

MEASURES OF EFFECTIVENESS (MOEs)	NETWORKS			
	Base Condition with No Transportation Improvements	Transportation Alternative 3A2	Change	% Change
Corridor VMT	56,684	51,250	- 5,434	- 9.6%
Corridor VHT	6,363	4,226	- 2137	- 33.6%
Corridor Average Speed	8.91 mph	12.13 mph	+3.24 mph	+ 36.4%
Corridor Total Signal Delay in Hours	5,093	2,485	- 2,608	- 51.2%
Corridor Signal Delay/ Vehicle in Seconds	55	28	- 27	- 49.1%
Corridor Queuing Penalty	49,014	29,807	-19,207	- 39.2%
Corridor Unserved Vehicles	38,689	13,526	-25,163	- 65.0%
Corridor Performance Index	6974.6	3616.2	(+) 3358.4	(+) 48.2%
Corridor Fuel Consumption in Gallons	7,813	4,642	- 3,171	- 40.6%
Corridor Fuel Economy (Miles per Gallon)	7.2	11.5	+ 4.3	+ 59.7%
Signalized intersections at LOS E/F	16 of 17	8 of 17	-	-

Interpretation of Analysis Results for the SR1 Corridor:

- The SR1 corridor shows similar performance improvements as that of in the Alternative 3A1. Thus, this alternative would have similar ramp junction LOS results and individual signalized intersection performance results along SR1 corridor as that of in alternative 3A1.

IV. TRANSPORTATION ALTERNATIVE 3A3:

A. Overall Study Area Wide Analysis

Table 8 shows the overall study area wide measures of effectiveness for the Transportation Alternative 3A3.

TABLE 8
Performance Change for the Entire Study Area Under Transportation Alternative 3A3

MEASURES OF EFFECTIVENESS (MOEs)	NETWORKS			
	Base Condition with No Transportation Improvements	Transportation Alternative 3A3	Change	% Change
Overall Network VMT	88,852	98,722	+ 9,870	+ 11.1%
Overall Network VHT	18,451	12,574	- 5,877	- 31.9%
Overall Network Average Speed	4.82 mph	7.85 mph	+ 3.03	+ 62.9%
Overall Network Total Signal Delay in Hours	16,376	9,556	- 6,820	- 41.6%
Overall Network Signal Delay/ Vehicle in Seconds	134	79	- 55	- 41.0%
Overall Network Queuing Penalty	68,173	47,756	- 20,417	- 29.9%
Overall Network Unserved Vehicles	47,242	19,496	- 27,746	- 58.7%
Overall Network Performance Index	19480.5	11486.7	(+)7993.8	(+)41.0%
Fuel Consumption for Overall Network in Gallons	20,131	12,452	- 7,679	- 38.1%
Overall Network Fuel Economy (Miles per Gallon)	4.4	7.9	+ 3.5	+ 79.5%
Signalized intersections at LOS E/F	20 of 22	13 of 33	-	-

Interpretation of the analysis results:

Transportation alternative 3A2 shows similar improvements as that of Alternative 3A1 and 3A2 (slightly better MOE outputs than 3A1 and slightly lesser than 3A2).

Advantage of Alternative 3A3 over 3A1:

Same as advantage of 3A2 over 3A1 mentioned earlier.

Disadvantage of Alternative 3A3 over 3A1:

Same as disadvantage of 3A2 over 3A1 mentioned earlier.

Disadvantage of Alternative 3A3 over 3A2:

Since this bypass alignment connects Rd. 273 more to the west (away from SR1) than the extension of Rd. 275, all the bypassing traffic would have to travel through already developed residential areas on the either sides of Rd. 273.

Also, since this alternative does not include extension of Rd. 275, it provides reduced circulation flexibility compared to alternative 3A2.

Alternative 3A3 would also have more environmental constraints, as the proposed bypass alighment (south of SR24) in this alternative will be passing through wetland areas. It will also be passing very close to a agricultural preservation area between SR24 and Rd. 274.

B. Corridor Analysis

The performance improvement due to Alternative 3A3 along the SR1 corridor is shown in **Table 9.**

TABLE 9
Performance Improvement along SR1 Corridor
Due to Alternative 3A3

MEASURES OF EFFECTIVENESS (MOEs)	NETWORKS			
	Base Condition with No Transportation Improvements	Transportation Alternative 3A3	Change	% Change
Corridor VMT	56,684	50,687	- 5,997	- 10.6%
Corridor VHT	6,363	4,112	- 2,251	- 35.4%
Corridor Average Speed	8.91 mph	12.32 mph	+3.41 mph	+ 38.3%
Corridor Total Signal Delay in Hours	5,093	2,390	- 2,703	- 53.1%
Corridor Signal Delay/ Vehicle in Seconds	55	27	- 28	- 50.9%
Corridor Queuing Penalty	49,014	28,975	-20,039	- 40.9%
Corridor Unserved Vehicles	38,689	12,893	-25,796	- 66.7%
Corridor Performance Index	6974.6	3491.1	(+) 3483.5	(+) 49.9%
Corridor Fuel Consumption in Gallons	7,813	4,536	- 3,277	- 41.9%
Corridor Fuel Economy (Miles per Gallon)	7.2	11.6	+ 4.4	+ 61.1%
Signalized intersections at LOS E/F	16 of 17	8 of 17	-	-

Interpretation of Analysis Results for the SR1 Corridor:

- The SR1 corridor shows similar (slightly better) performance improvements compared to Alternatives 3A1 and 3A2. Thus, this alternative would have similar ramp junction LOS results and individual signalized intersection performance results along SR1 corridor as that of in alternative 3A1.

INFERENCE:

Alternative 3A shows extensive improvement in the study area transportation network as well as SR1 corridor performance compared to Alternatives 1A, 1B and 2. This alternative is feasible due to vacant land available to the west of Plantations Road and would have reduced impacts on the existing development as compared to the other alternatives.

Under alternative 3A, all the three sub-options (3A1, 3A2 and 3A3) show very similar improvement results. The advantages and disadvantages of every sub-option over remaining sub-options should be assessed and evaluated closely before choosing location of new bypass alignment south of SR24.

State Route 1 Land Use/Transportation Study

Technical Memorandum

F. Transportation Alternative 3B Analysis

Prepared For:
Delaware Department of Transportation

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I. INTRODUCTION:

The purpose of this memorandum is to document the qualitative and quantitative improvements in the performance of the SR1 study area transportation network due to Transportation Alternative 3B (with three sub-options 3B1, 3B2, and 3B3) for the 2025 preferred land use scenario.

Transportation Improvements Under Alternative 3B:

Transportation improvements under alternative 3B are same as that of 3A, except there would be no diamond interchange at the Five Points intersection under 3B.

Major improvements reflected by traffic model:

- Limited bypass alignment (between north of Five Points and SR24) with signalized intersections.
- SR24 corridor with 4-lane section.
- Option 3B1: Road 275 (Plantations Road) extension up to Road 273.
- Option 3B2: Road 275 (Plantations Road) extension up to Road 273 with direct connection from new bypass alignment.
- Option 3B3: Continuation of limited bypass alignment between SR24 and Rd. 273.

Minor improvements reflected by traffic model:

- Signal system optimization and coordination.
- Intersection improvements at Rd. 275 and Postal Lane intersection, SR24 and Rd. 274 intersection, and Rd. 275 and Rd. 274 intersection.
- Cedar Grove Rd. realignment at Rd. 275 / Postal Lane / Cedar Grove Rd. intersection.
- Signalization of Rd. 275 and Postal Lane intersection, and Rd. 275 and Rd. 274 intersection.

Other minor improvements considered that could not be reflected by traffic model:

- Improved traffic signs along SR1 corridor.
- Multi-use paths along SR1 corridor and bike lanes along Rd.275 corridor.
- Transit regulations regarding use of shoulders during non-peak hours.

II. TRANSPORTATION ALTERNATIVE 3B1:

A. Overall Study Area Wide Analysis

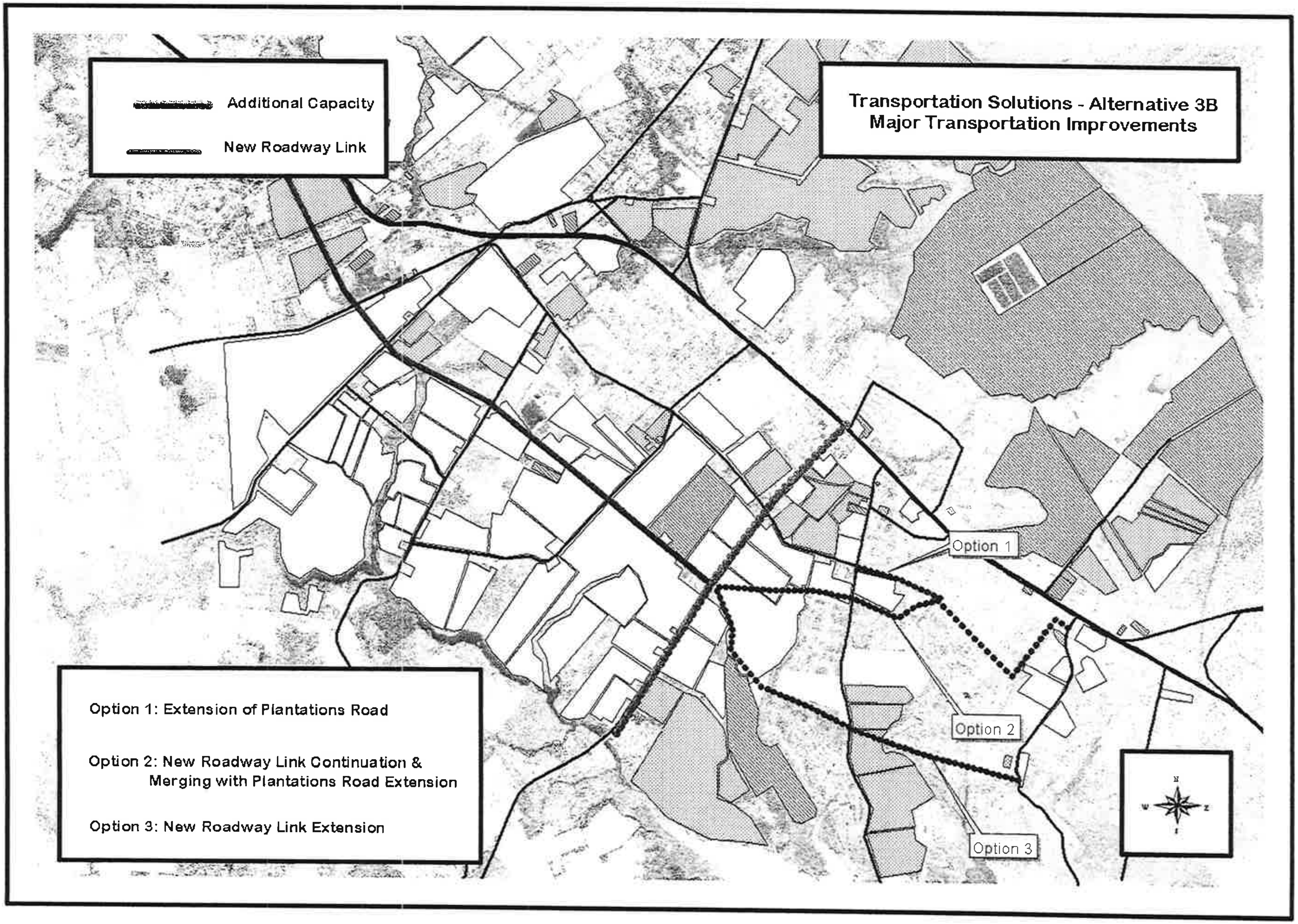

Transportation Solutions - Alternative 3B
Major Transportation Improvements
Additional Capacity
New Roadway Link
Option 1
Option 2
Option 3
Option 1: Extension of Plantations Road
Option 2: New Roadway Link Continuation & Merging with Plantations Road Extension
Option 3: New Roadway Link Extension

Table 1 shows the overall study area wide measures of effectiveness for the Transportation Alternative 3B1.

TABLE 1
Performance Change for the Entire Study Area Under Transportation Alternative 3B1

MEASURES OF EFFECTIVENESS (MOEs)	NETWORKS			
	Base Condition with No Transportation Improvements	Transportation Alternative 3B1	Change	% Change
Overall Network VMT	88,852	97,023	+ 8,171	+ 9.2%
Overall Network VHT	18,451	12,902	- 5,549	- 30.1%
Overall Network Average Speed	4.82 mph	7.52 mph	+ 2.7	+ 56.0%
Overall Network Total Signal Delay in Hours	16,376	9,958	- 6,418	- 39.2%
Overall Network Signal Delay/ Vehicle in Seconds	134	84	- 50	- 37.3%
Overall Network Queuing Penalty	68,173	48,014	- 20,159	- 29.6%
Overall Network Unserved Vehicles	47,242	24,502	- 22,740	- 48.1%
Overall Network Performance Index	19480.5	11924.5	(+) 7556	(+)38.8%
Fuel Consumption for Overall Network in Gallons	20,131	12,699	- 7,432	- 36.9%
Overall Network Fuel Economy (Miles per Gallon)	4.4	7.6	+ 3.2	+ 72.7%
Signalized intersections at LOS E/F	20 of 22	17 of 31	-	-

Interpretation of the analysis results:

- Transportation Alternative 3B1 shows almost similar overall network performance improvements as that of 3A1 (MOEs for 3A1 are slightly better than that of for 3B1).

- Although overall network performance does not deteriorate much if grade separation (via a diamond interchange) is not provided at Five Points, the network will have extensive localized performance deterioration in the vicinity of this intersection.

- In absence of a diamond interchange at Five Points, northbound traffic on SR1 heading towards US9 west would opt for alternate routes (bypass, Rd. 275) to access US9 instead of turning left from northbound SR1 to westbound US9 at the Five Points intersection.

- Southbound and northbound through traffic on SR1 at Five Points intersection would experience long delays at this intersection due to a lack of grade separation.

- Southbound traffic on SR1 intending to make right turn on US9 west at Five Points intersection would be impacted minimally due to lack of grade separation.

B. Corridor Analysis

It is important to analyze the improvement in the performance of the SR1 corridor individually due to transportation alternative 3B1. The performance improvement along the SR1 corridor is shown in **Table 2.**

TABLE 2
Performance Improvement along SR1 Corridor

MEASURES OF EFFECTIVENESS (MOEs)	NETWORKS			
	Base Condition with No Transportation Improvements	Transportation Alternative 3B1	Change	% Change
Corridor VMT	56,684	47,951	- 8,733	- 15.4%
Corridor VHT	6,363	4,075	- 2,288	- 36.0%
Corridor Average Speed	8.91 mph	11.77 mph	+2.86 mph	+ 32.1%
Corridor Total Signal Delay in Hours	5,093	2,511	- 2,582	- 50.7%
Corridor Signal Delay/ Vehicle in Seconds	55	30	- 25	- 45.5%
Corridor Queuing Penalty	49,014	27,559	-21,455	- 43.8%
Corridor Unserved Vehicles	38,689	13,723	-24,966	- 64.5%
Corridor Performance Index	6974.6	3584.7	(+) 3389.9	(+) 48.6%
Corridor Fuel Consumption in Gallons	7,813	4,453	- 3,360	- 43.0%
Corridor Fuel Economy (Miles per Gallon)	7.2	10.8	+ 3.6	+ 50.0%
Signalized intersections at LOS E/F	16 of 17	10 of 18	-	-

Interpretation of Analysis Results for the SR1 Corridor:

- The SR1 corridor shows similar improvement in the performance as that of alternative 3A1. The effects of deterioration in corridor performance, due to at grade intersection at Five Points, are partially nullified due to reduction in northbound traffic volumes along SR1 corridor.

C. Localized Performance Improvements:

Table 3 shows localized improvements in the performance of signalized intersections along SR1 between Five Points and Rd.273. **Table 4** shows improvements at some other locations due to major and minor improvements proposed under the transportation alternative 3B1.

TABLE 3

Transportation Alternative 3B1: Performance Improvement at Signalized Intersections along SR1 between Five Points and Road 273

Signalized Intersection Location	Signalized Intersection LOS (Transportation Base Alternative)	Signalized Intersection LOS (Transportation Alternative 3B1)
SR1 and US9/SR18 (Five Points)	F (247.0 sec)	F (230.8 sec)
SR1 and Westcoats Road	F (93.4 sec)	B (15.5 sec)
SR1 and Darthmouth Drive	F (211.7 sec)	F (94.8 sec)
SR1 and Postal Lane	F (93.6 sec)	C (29.0 sec)
SR1 and Midway Shopping Center	F (108.4 sec)	D (53.9 sec)
SR1 and SR24	F (108.2 sec)	F (102.1 sec)
SR1 and Rehoboth Mall	C (25.4 sec)	B (10.0 sec)
SR1 and Road 274	F (98.5 sec)	D (41.3 sec)
SR1 and Munchy Branch Road	F (117.9 sec)	F (111.5 sec)
SR1 and Camelot	F (179.2 sec)	F (153.5 sec)
SR1 and K-Mart	F (101.2 sec)	E (55.4 sec)
SR1 and Road 273	F (88.6 sec)	D (50.3 sec)

TABLE 4
Performance Betterment Due to Transportation Improvements under Alternative 3B1

Signalized Intersection	**NETWORKS**	
	Base Condition with No Transportation Improvements	**Transportation Alternative 3B1**
Rd. 275 & Postal Lane Improvement: Realignment, intersection improvement and signalization		
Intersection LOS	F	E
Intersection Delay	602. 6 sec. (Unsignalized)	60.7 sec.
Rd. 275 & SR24 Improvement: Intersection improvement, Additional Lanes on Rd.275 and SR24		
Intersection Delay	256.6 sec.	168.8 sec.
Rd. 275 & Rd. 274 Improvement: Intersection improvement and signalization		
Overall Intersection Delay	285.1 sec.	149.3 sec.
State Route 1 & Bay Vista Road Improvement: Signal Optimization		
Intersection LOS	F	C
Intersection Signal Delay	244.4 sec.	28.9 sec.

III. TRANSPORTATION ALTERNATIVE 3B2:

A. Overall Study Area Wide Analysis

Table 5 shows the overall study area wide measures of effectiveness for the Transportation Alternative 3B2.

TABLE 5
Performance Change for the Entire Study Area Under Transportation Alternative 3B2

MEASURES OF EFFECTIVENESS (MOEs)	NETWORKS			
	Base Condition with No Transportation Improvements	Transportation Alternative 3B2	Change	% Change
Overall Network VMT	88,852	97,092	+ 8,240	+ 9.3%
Overall Network VHT	18,451	12,724	- 5,727	- 31.0%
Overall Network Average Speed	4.82 mph	7.63 mph	+ 2.81	+ 58.3%
Overall Network Total Signal Delay in Hours	16,376	9,764	- 6,612	- 40.4%
Overall Network Signal Delay/ Vehicle in Seconds	134	82	- 52	- 38.8%
Overall Network Queuing Penalty	68,173	48,110	- 20,063	- 29.4%
Overall Network Unserved Vehicles	47,242	21,665	- 25,577	- 54.1%
Overall Network Performance Index	19480.5	11721.7	(+)7758.8	(+)39.8%
Fuel Consumption for Overall Network in Gallons	20,131	12,516	- 7,615	- 37.8%
Overall Network Fuel Economy (Miles per Gallon)	4.4	7.8	+ 3.4	+ 77.3%
Signalized intersections at LOS E/F	20 of 22	16 of 33	-	-

Interpretation of the analysis results:

Transportation alternative 3B2 shows similar improvements as that of Alternative 3B1 (slightly better MOE outputs than 3B1).

Transportation Improvement Alternative 3B is similar to Alternative 3A except for diamond interchange at Five Points. Thus, all the advantages and disadvantages of alternative 3B2 over 3B1 remain just the same as that of advantages and disadvantages of alternative 3A2 over 3A1 noted in the previous technical memorandum.

B. Corridor Analysis

The performance improvement due to Alternative 3B2 along the SR1 corridor is shown in **Table 7.**

TABLE 7
Performance Improvement along SR1 Corridor
Due to Alternative 3B2

MEASURES OF EFFECTIVENESS (MOEs)	NETWORKS			
	Base Condition with No Transportation Improvements	Transportation Alternative 3B2	Change	% Change
Corridor VMT	56,684	46,159	-10,525	- 18.6%
Corridor VHT	6,363	3,746	- 2,617	- 41.1%
Corridor Average Speed	8.91 mph	12.32 mph	+3.41 mph	+ 38.3%
Corridor Total Signal Delay in Hours	5,093	2,242	- 2,851	- 56.0%
Corridor Signal Delay/ Vehicle in Seconds	55	27	- 28	- 50.9%
Corridor Queuing Penalty	49,014	26,424	-22,590	- 46.1%
Corridor Unserved Vehicles	38,689	12,281	-26,408	- 68.3%
Corridor Performance Index	6974.6	3263.4	(+) 3711.2	(+) 53.2%
Corridor Fuel Consumption in Gallons	7,813	4,141	- 3,672	- 47.0%
Corridor Fuel Economy (Miles per Gallon)	7.2	11.1	+ 3.9	+ 54.2%
Signalized intersections at LOS E/F	16 of 17	8 of 18	-	-

Interpretation of Analysis Results for the SR1 Corridor:

- The SR1 corridor shows improved performance as compared to the Alternative 3B1 as well as 3A2. The MOEs for SR1 corridor show that due to the absence of diamond interchange at Five Points, more traffic would shift to the new bypass alignment improving the performance of SR1 significantly, especially in terms of corridor signal delay and travel time.

IV. TRANSPORTATION ALTERNATIVE 3B3:

A. Overall Study Area Wide Analysis

Table 8 shows the overall study area wide measures of effectiveness for the Transportation Alternative 3B3.

TABLE 8
Performance Change for the Entire Study Area Under Transportation Alternative 3B3

MEASURES OF EFFECTIVENESS (MOEs)	NETWORKS			
	Base Condition with No Transportation Improvements	Transportation Alternative 3B3	Change	% Change
Overall Network VMT	88,852	100,269	+ 11,417	+ 12.8%
Overall Network VHT	18,451	12,813	- 5,638	- 30.6%
Overall Network Average Speed	4.82 mph	7.83 mph	+ 3.01	+ 62.5%
Overall Network Total Signal Delay in Hours	16,376	9,742	- 6,634	- 40.5%
Overall Network Signal Delay/ Vehicle in Seconds	134	82	- 52	- 38.8%
Overall Network Queuing Penalty	68,173	46,279	- 21,894	- 32.1%
Overall Network Unserved Vehicles	47,242	20,401	- 26,841	- 56.8%
Overall Network Performance Index	19480.5	11656.3	(+)7824.2	(+)40.2%
Fuel Consumption for Overall Network in Gallons	20,131	12,642	- 7,489	- 37.2%
Overall Network Fuel Economy (Miles per Gallon)	4.4	7.9	+ 3.5	+ 79.5%
Signalized intersections at LOS E/F	20 of 22	15 of 33	-	-

Interpretation of the analysis results:

Transportation alternative 3B3 shows similar improvements as that of Alternative 3B1 and 3B2 (slightly better MOE outputs than 3B1 and slightly lesser than 3B2).

Transportation Improvement Alternative 3B is similar to Alternative 3A except for the diamond interchange at Five Points. Thus, all the advantages and disadvantages of alternative 3B3 over 3B1 / 3B2 remain just the same as that of advantages and disadvantages of alternative 3A3 over 3A1 /3A2, noted in the previous technical memorandum.

B. Corridor Analysis

The performance improvement due to Alternative 3B3 along the SR1 corridor is shown in **Table 9.**

TABLE 9
Performance Improvement along SR1 Corridor Due to Alternative 3B3

MEASURES OF EFFECTIVENESS (MOEs)	NETWORKS			
	Base Condition with No Transportation Improvements	Transportation Alternative 3B3	Change	% Change
Corridor VMT	56,684	46,899	- 9,785	- 17.3%
Corridor VHT	6,363	3,765	- 2,598	- 40.8%
Corridor Average Speed	8.91 mph	12.45 mph	+3.54 mph	+ 39.7%
Corridor Total Signal Delay in Hours	5,093	2,236	- 2,857	- 56.1%
Corridor Signal Delay/ Vehicle in Seconds	55	27	- 28	- 50.9%
Corridor Queuing Penalty	49,014	26,478	-22,536	- 45.9%
Corridor Unserved Vehicles	38,689	12,068	-26,621	- 68.8%
Corridor Performance Index	6974.6	3259.6	(+) 3715.0	(+) 53.3%
Corridor Fuel Consumption in Gallons	7,813	4,169	- 3,644	- 46.6%
Corridor Fuel Economy (Miles per Gallon)	7.2	11.2	+ 4.0	+ 55.6%
Signalized intersections at LOS E/F	16 of 17	9 of 18	-	-

Interpretation of Analysis Results for the SR1 Corridor:

- The SR1 corridor shows similar (slightly better) performance improvements compared to Alternatives 3B1 and 3B2. The performance improvement is mainly due to a higher shift in traffic to the new bypass alignment to avoid failing signalized intersections along SR1 corridor.

INFERENCE:

Alternative 3B shows extensive improvement in the study area transportation network as well as SR1 corridor performance compared to Alternatives 1A, 1B and 2. Between alternatives 3A and 3B, 3A shows slightly better network wide results compared to 3B.

But when analyzed at SR1 corridor level, alternative 3B shows slightly better MOEs compared to 3A. This is mainly because of greater traffic shifts to the new bypass alignment in absence of the diamond interchange at Five Points.

Alternatives 3A and 3B are likely more feasible than 1A, 1B, 2 due to vacant land available to the west of Plantations Road and alternatives 3A and 3B would have reduced impacts on existing development compared to other alternatives.

Under alternative 3B, all the three sub-options (3B1, 3B2 and 3B3) show similar improvement results. The advantages and disadvantages of every sub-option over remaining sub-options should be assessed closely before choosing location of new bypass alignment south of SR24.

In summary an important issue can be raised as to the attractiveness of SR1 and to subsequent corridor volumes. Although the analysis results for SR1 corridor under Alternative 3 (both 3A and 3B) show an extensive improvement in the performance of SR1 corridor with significant reduction in traffic volumes, it should be noted that the traffic volume reduction and performance improvement along SR1 corridor might subsequently over time, attract more through traffic which could eventually impact the performance of the corridor, if this were to occur. This issue raises the importance of the development of a limited access US 113 corridor to provide an alternative routing for southern Delaware resort travel.

State Route 1 Land Use & Transportation Plan

Appendix IV Land Use & Transportation Plan

Transportation Improvements Comparison

I. Introduction

The purpose of this memorandum is to compare the alternative transportation improvement scenarios identified and analyzed in the SR1 Land Use & Transportation Study. A two step travel modeling process was utilized. The first step involved the completion of TranPlan model runs for each major transportation improvement scenario. Forecasted link volumes from the TranPlan model (the network in DelDOT's TranPlan model was enhanced for this effort to include all major roadways within the study area) were then used as inputs into the Synchro models that were developed for each major transportation improvement scenario. Synchro models were used as the second step in the analysis of the major transportation improvement scenarios. The Synchro models have the capability of producing various measures of effectiveness (MOEs), such a VMT, VHT, and signal delay, among others. These MOEs allow for the comparison of the performance improvement that can be expected under each of the major transportation improvement scenarios. Additionally, Synchro contains a simulation component (Sim Traffic) that allows for the animated simulation of traffic on a transportation network. This visual component of Synchro has made it a useful tool in presentations to the SR1 Land Use & Transportation Study Public Advisory Committee (PAC) on the effects of various transportation improvements, as well as in the analysis of land use scenarios.

II. Major Transportation Improvement Scenarios

The major transportation improvement scenarios identified for the SR1 Land Use & Transportation Study are major transportation infrastructure improvement options or concepts for improving the transportation system in the study area.

As the SR1 Land Use & Transportation Study has shown, SR 1 from Five Points to Rehoboth/Dewey Beach currently suffers from seasonal congestion and deteriorated levels of service in peak hours. This study has shown that congestion generated by local, non-seasonal traffic is forecasted to grow significantly – under any future land use scenario examined. In the future, SR 1 between Five Points and Rehoboth/Dewey Beach will experience locally generated, recurring, year-round, peak-hour congestion. This is due to the rapid residential land use growth that has been occurring in the study area (base land use scenario) and is expected to continue. In summary, due to land use development in the study area, transportation improvements need to be made to accommodate the growth.

The transportation improvement options or concepts that were examined in the SR1 Land Use & Transportation Study were identified during the PAC and public involvement component of the study. Minor short-term transportation improvements such as individual intersection improvements, intersection realignments, signal optimization & coordination were coupled with each of the major scenarios to analyze the impact to the transportation network in the study area.

Three major transportation improvement scenarios were identified. Two scenarios looked at adding transportation capacity to the study area by improving the capacity of existing transportation facilities. The third scenario encompassed the idea of a new roadway, which would provide additional, new transportation capacity to the study area.

The components of the three major transportation improvement scenarios are as follows:

Alternative #1: Add capacity to Road 275 and SR 24
This alternative incorporates the solution of providing additional roadway capacity to existing facilities (Road 275 and SR24). These facilities will require additional capacity based on the traffic analysis completed on the base land use scenario as well as all future land use scenarios examined. This alternative was developed to address the problem of existing and future congestion on the SR1 corridor and future congestion on the SR24 corridor and Road 275 corridor.

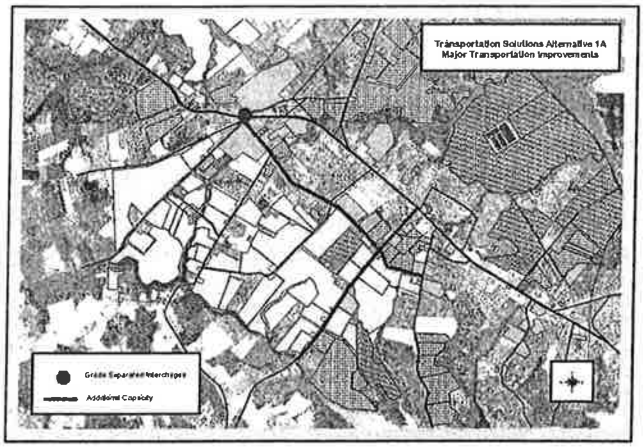
- Two sub-alternatives were identified and analyzed
  - 1A – Provide a grade-separated diamond interchange at 5-Points
  - 1B – No grade separation

The grade separation sub-alternative was examined to help reduce excessive delays that currently exist and are forecasted to exist under the No-Build condition (to include all land use scenarios examined) at the 5-Points intersection. A diamond interchange at this location would help to provide better connections to intersecting roads from SR1. Additionally, by eliminating conflicting turning movements that occur at an at-grade intersection, improvements to safety could be expected. This is of note as the 5-Points intersection is currently included in DelDOT's Highway Safety Improvement Program due to the intersection being a high accident location.

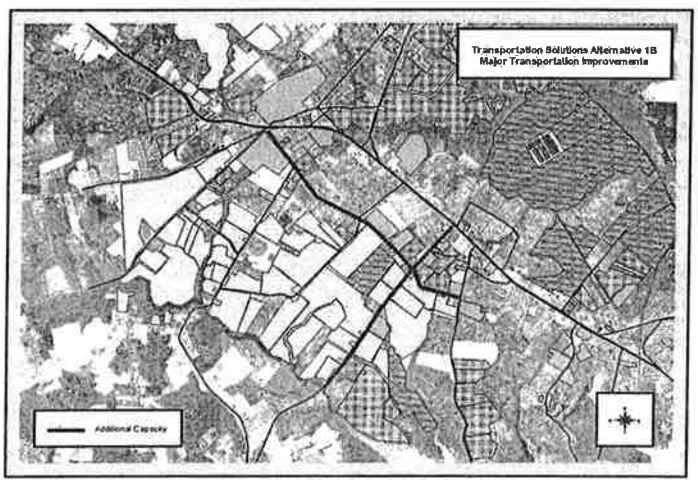
Additional capacity along Road 275 was examined to help move forecasted increases in local traffic effectively as the study area continues to develop. Providing additional capacity to Road 275 would also provide an improved corridor parallel to SR1 as an alternate routing for some trips.

Additional capacity along SR24 was examined to help move forecasted increases in local traffic volumes as the study area continues to develop.

Alternative 1A



Alternative 1B

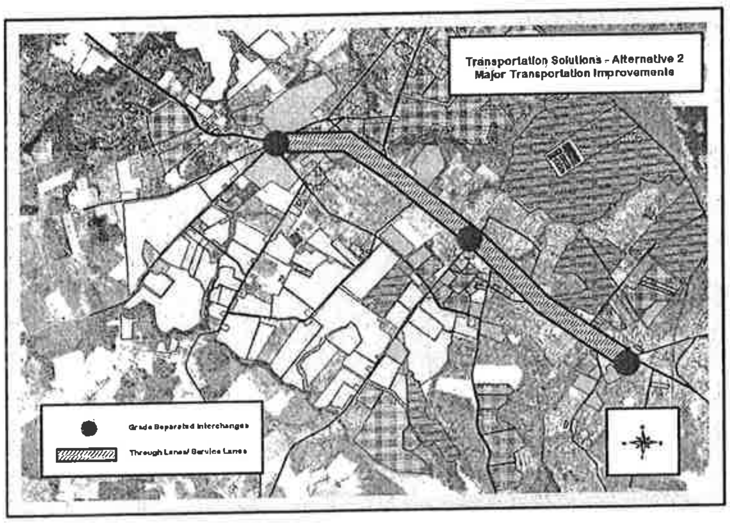


Alternative # 2: Commercial Arterial Concept for SR1 with through and local lanes with grade-separated diamond interchanges at Five Points, SR24 and Rehoboth Avenue

This alternative incorporates the solution of providing a service and express roadway concept to SR1 to separate local and through traffic movements (through traffic would include Rehoboth Beach/Dewey traffic as well). Inner lanes would be express lanes while outside lanes would function as one-way local lanes. The express lanes would be barrier separated with slip ramps allowing access to and from the local lanes. Express lanes would operate as a free flow facility without traffic signals. Local lanes would have traffic signals controlling movements from major intersecting streets and driveways, where needed. This alternative was developed to address the problem of existing and future congestion on the SR1 corridor. Under this improvement alternative, the SR1 corridor will attempt to provide mobility for both through traffic as well as local traffic.

This alternative was examined with grade-separated interchanges at Five Points, SR24 and Rehoboth Avenue intersections. These grade-separations improvements address the congestion present under existing conditions at these intersections (as well as the No-Build and all land use scenarios examined). Additionally, interchanges are needed to provide opportunities for through and local travel to reverse direction or to cross SR1 in a traffic environment where separate through and local lanes are operating.

Alternative 2



Alternative # 3A1, 3A2, 3A3 and 3B1, 3B2, and 3B3: New By-Pass Roadway Concept

These alternatives incorporate the solution of providing additional roadway capacity on a new roadway facility. The need for additional capacity in the SR1 study area was identified in the analysis completed on the base land use scenario as well as all future land use scenarios examined. This alternative was developed to address the problem of existing and future congestion on the SR1 corridor, and future congestion on the SR24 corridor and the Road 275 corridor. As the study area develops, the new roadway would serve to divert local trips from SR 1 and Road 275, thus improving flow on these existing facilities. The new alignment would serve as a limited by-pass of SR1 within the study area.

These alternatives were examined with and without a grade-separated interchange at the Five Points intersection. The grade-separation alternative at

Five Points addresses the congestion present under the existing condition at this intersection.

The roadway options of 1, 2 and 3 provide various conceptual options for the continuation of the facility to the east of SR24. They have been conceptualized in such a way as to minimize impact on existing development and environmentally sensitive areas while at the same time as improving local mobility.

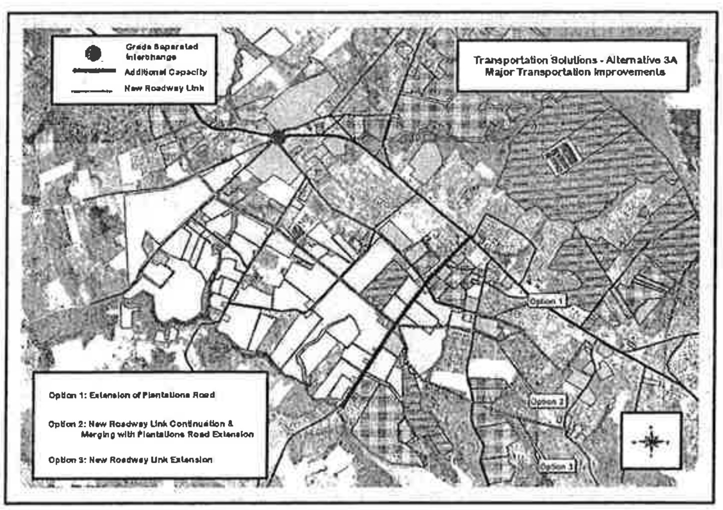
Under Alternative 3A the following was assumed:

- Grade separated diamond interchange at the Five Points intersection.
- The new roadway will be a controlled access roadway (between north of Five Points and SR24) with signalized intersections.
- SR24 corridor within the study area as a 4-lane roadway.

For the continuation options east of SR24 the following are assumed as sub-alternatives:

- Option 3A1: Road 275 (Plantations Road) extension up to Road 273.
- Option 3A2: Road 275 (Plantations Road) extension up to Road 273 with a direct connection from new bypass alignment.
- Option 3A3: Continuation of limited bypass alignment between SR24 and Rd. 273.

Alternative 3A1, 3A2 & 3A3



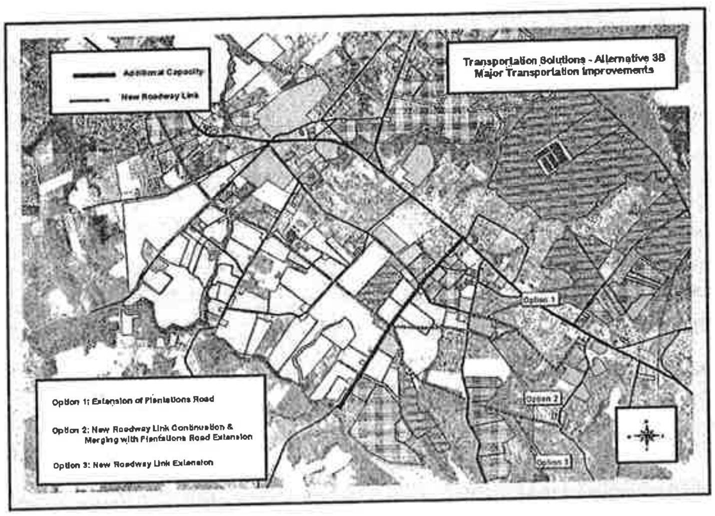
For Alternative 3B the following are assumed:

- Controlled access alignment (between north of Five Points and SR24) with signalized intersections.
- SR24 corridor with 4-lane section.

Similar to the other alternative, similar alignments for the extension of the new roadway east of SR 24 are assumed as sub-alternatives:

- Option 3B1: Road 275 (Plantations Road) extension up to Road 273.
- Option 3B2: Road 275 (Plantations Road) extension up to Road 273 with a direct connection from new bypass alignment.
- Option 3B3: Continuation of limited bypass alignment between SR24 and Rd. 273.

Alternative 3B1, 3B2 & 3B3



Minor transportation improvements such as individual intersection improvements (additional storage length, provision of left turn lane, etc.), intersection realignments, signal coordination and safety improvements were coupled with each of the major alternatives.

The travel demand modeling process established during the SR1 Land Use & Transportation Study was used to evaluate the effectiveness of the above transportation alternatives. The 2025 TranPlan and Synchro networks established for the preferred land use scenario (activity center/village scenario) with network signals optimized and coordinated will be used as the base network, representing the No-Build Condition. This No-Build Condition will be used as a comparative benchmark to determine how well each of the alternatives perform in terms of changes to the measures of effectiveness (MOEs) established and used in the SR1 Land Use & Transportation Study during the analysis of the alternative land use scenarios.

III. Transportation Improvement Comparison

Measures of effectiveness (MOEs) were used to compare and contrast the results for the transportation alternatives. These MOEs were examined at two levels:

- Study Area Analysis - What is the benefit of the transportation alternative to the performance of the entire transportation network in the study area?
- SR1 Analysis – What is the benefit of the transportation alternative to the performance of SR1?

The tables on the following pages provide a comparison of the MOEs generated at these two levels for each of the transportation alternatives examined.

Transportation Improvement Alternatives: Comparative MOE Performance Summary

NETWORKWIDE MEASURES OF EFFECTIVENESS (MOE): COMPARISONS FOR ALL TRANSPORTATION IMPROVEMENT ALTERNATIVES:

MEASURES OF EFFECTIVENESS (MOEs)	Transportation Improvement Alternatives									
	Base Condition with No Transportation Improvements	Transportation Alternative 1A	Transportation Alternative 1B	Transportation Alternative 2	Transportation Alternative 3A1	Transportation Alternative 3A2	Transportation Alternative 3A3	Transportation Alternative 3B1	Transportation Alternative 3B2	Transportation Alternative 3B3
Overall Network VMT	88,852	89,919	89,390	91,916	96,355	96,057	98,722	97,023	97,092	100,269
Overall Network VHT	18,451	16,416	16,813	19,251	12,651	12,471	12,574	12,902	12,724	12,813
Overall Network Average Speed	4.82 mph	5.48 mph	5.31 mph	4.77 mph	7.62 mph	7.70 mph	7.85 mph	7.52 mph	7.63 mph	7.83 mph
Overall Network Total Signal Delay in Hours	16,376	14,318	14,688	16,862	9,729	9,543	9,556	9,958	9,764	9,742
Overall Network Signal Delay/ Vehicle in Seconds	134	114	120	139	80	78	79	84	82	82
Overall Network Performance Index*	19480.5	16756.2	17220.7	19324.9	11758.0	11484.1	11486.7	11924.5	11721.7	11656.3
Fuel Consumption for Overall Network in Gallons	20,131	16,767	17,047	18,435	12,512	12,325	12,452	12,699	12,516	12,642
Overall Network Fuel Economy (Miles per Gallon)	4.4	5.4	5.2	5.0	7.7	7.8	7.9	7.6	7.8	7.9
Signalized intersections at LOS E/F	20 of 22	19 of 25	19 of 25	24 of 36	14 of 32	15 of 34	13 of 33	17 of 31	16 of 33	15 of 33

*** Performance Index is a value derived by Synchro Model based on combined effects of delays, stops and queues. The lower the value of the performance index, the better the performance of the network.**

Transportation Improvement Alternatives: Comparative MOE Performance Summary

SR1 CORRIDOR MEASURES OF EFFECTIVENESS (MOE): COMPARISONS FOR ALL TRANSPORTATION IMPROVEMENT ALTERNATIVES:

MEASURES OF EFFECTIVENESS (MOEs)	Transportation Improvement Alternatives										
	Base Condition with No Transportation Improvements	Transportation Alternative 1A	Transportation Alternative 1B	Transportation Alternative 2		Transportation Alternative 3A1	Transportation Alternative 3A2	Transportation Alternative 3A3	Transportation Alternative 3B1	Transportation Alternative 3B2	Transportation Alternative 3B3
				Local	Express						
SR1 Corridor VMT	56,684	54,761	53,529	20,073	35,720	51,850	51,250	50,687	47,951	46,159	46,899
SR1 Corridor VHT	6,363	4,609	5,135	2,981	1,137	4,344	4,226	4,112	4,075	3,746	3,765
SR1 Corridor Average Speed	8.91 mph	11.88 mph	10.42 mph	6.73 mph	31.42 mph	12.0 mph	12.13 mph	12.32 mph	11.77 mph	12.32 mph	12.45 mph
SR1 Corridor Total Signal Delay in Hours	5,093	3381	3,541	2,311	316	2,584	2,485	2,390	2,511	2,242	2,236
SR1 Corridor Signal Delay/ Vehicle in Seconds	55	36	39	92	6	29	28	27	30	27	27
SR1 Corridor Performance Index*	6974.6	4926.7	5052.5	3297.6	461.2	3729.9	3616.2	3491.1	3584.7	3263.4	3259.6
Fuel Consumption for SR1 Corridor in Gallons	7,813	6,056	6,382	3,027	1,719	4,761	4,642	4,536	4,453	4,141	4,169
SR1 Corridor Fuel Economy (Miles per Gallon)	7.2	9.0	8.4	6.6	20.8	11.3	11.5	11.6	10.8	11.1	11.2
SR1 Signalized intersections at LOS E/F	16 of 17	13 of 16	14 of 17	18 of 24	2 of 4	9 of 17	8 of 17	8 of 17	10 of 18	8 of 18	9 of 18

*** Performance Index is a value derived by Synchro Model based on combined effects of delays, stops and queues. The lower the value of the performance index, the better the performance of the corridor.**

IV. Discussion of Results

Alternative 1A and 1B: Add capacity to Road 275 and SR 24

Network-wide MOEs for these two alternatives do not show betterment over the No-Build that is significant enough to improve overall network performance. Alternatives 1A and 1B show localized improvements only. Additionally as the MOE's show, Alternatives 1A and 1B do not significantly affect the performance of SR1.

The modeling process indicated that the addition of only one new southbound lane on Road 275 was optimum for network performance. Providing additional southbound lanes on Road 275 did not divert additional vehicle trips from SR1. In the northbound direction, the addition of a northbound lane on Road 275 did not divert vehicle trips from SR1 to this roadway. For northbound travel, Road 275 does not serve as a convenient by-pass for SR1 traffic. As the modeling results show, even for southbound travel, Road 275 only serves as a limited by-pass.

Overall, the modeling results show that capacity improvements to Road 275 do not have much impact on the performance of the SR1 corridor. The modeling results show that Alternative 1A (with diamond interchange) provides a more positive impact to network performance than Alternative 1B (without diamond interchange). This is due to the reduction in delay associated with the provision of a diamond interchange at the 5-Points intersection. Due to the localized nature of improvements that can be expected from this alternative, this alternative could be combined with other possible alternatives to achieve improved network performance in the SR1 study area.

Alternative 2: Commercial Arterial Concept for SR1 with through and local lanes with grade-separated diamond interchanges at Five Points, SR24 and Rehoboth Avenue

The modeling results show that Alternative 2 provides negligible performance improvement in network wide MOEs, with some measures deteriorating under this alternative. Network VMT and VHT increase under this alternative.

Using SR1's current 6-lane cross-section, significant traffic would result in the local lanes and lane volumes would exceed capacity. This would result in extensive delays and queuing. To accommodate the volume of local traffic forecasted, two local lanes and two express lanes would need to be provided in each direction, which would necessitate an 8-lane cross-section for SR1. Additional paved width would be required beyond what is required for an 8-lane cross-section to accommodate the width needed for the slip ramps as well as for acceleration and deceleration lanes.

If two local lanes and two through lane were provided, capacity issues would still remain at the diamond interchanges. This alternative would work effectively only if sufficient capacity is provided at these locations. The modeling results show that 6 to 7 lanes would be required on the overpasses, with 3 to 4 lanes would be required on the ramps, 2 lanes would be required on the slip ramps with long acceleration and deceleration lane lengths. Significant right-of-way impacts would result if this improvement concept was implemented.

Alternative 3A1, 3A2, 3A3 and 3B1, 3B2, and 3B3: New By-Pass Roadway Concept ("A" alternatives assume a grade-separated diamond interchange at 5-Points; "B" alternatives assume existing at-grade 5-Points intersection)

The modeling results show that Alternative 3A (with a grade-separated diamond interchange at 5-Points) provides the most significant benefit to future network-wide travel conditions compared to the other alternatives examined.

Alternative 3B (without a grade-separated diamond interchange) provides the greatest benefit to SR1 performance compared to the other alternatives analyzed. This is because the delay associated with the at-grade intersection at 5-Points would remain under this alternative. This delay, in turn, reduces the attractiveness of SR1 as a travel path and greater numbers of vehicle trips are forecasted to divert to the new roadway.

For both Alternative 3A and 3B, although VMT increases, VHT decreases. This is because under this scenario, locally generated traffic would have two travel paths. As the study area develops, local traffic would shift to the new roadway.

The modeling results show that all three options to carry this new roadway, southeast of SR24, provide similar results in terms of MOEs.

State Route 1 Land Use & Transportation Plan

Appendix V Environmental Screening

Environmental Screening Technical Memorandum

State Route 1 Land Use/Transportation Study

Technical Memorandum

Environmental Screening

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ENVIRONMENTAL SCREENING TECHNICAL MEMORANDUM
STATE ROUTE 1
LAND USE/TRANSPORTATION STUDY
Sussex County, Delaware

TABLE OF CONTENTS

SECTION ***PAGE***

LIST OF FIGURES

LIST OF TABLES

Page

Environmental Screening Technical Memorandum

1.0 Introduction

This Environmental Screening Technical Memorandum was prepared as part of DelDOT's and Sussex County's State Route 1 Land Use/Transportation Study to provide guidance for the future growth of this portion of Sussex County in an environmentally responsible manner while also meeting transportation and land use needs. This Environmental Screening was conducted early-on within this planning phase of the project as opposed to during an engineering feasibility/scoping phase as is typically done. This was done in an effort to support early and effective interagency involvement on environmental issues to improve the outcome of each natural and cultural resource agency's mission, while minimizing costs and delays to DelDOT should an alternative be advanced for further study and development.

2.0 Methodology

The objective of this effort was to obtain all available information pertaining to the existing environmental conditions within the study area. Coordination was conducted with the following agencies via telephone, email, office visit, or their website:

- Delaware State Historic Preservation Office (SHPO)
- Lewes Historical Society
- Delaware Department of Natural Resources and Environmental Control (DNREC) Parks and Recreation
- DNREC Fish and Wildlife, Natural Heritage Program
- DNREC Air and Waste Management
- DNREC Division of Water Resources, SWAMP
- DNREC Whole Basin Management
- USEPA Wetlands Protection Program
- National Marine Fisheries Service
- United States Fish & Wildlife Service
- United States Army Corps of Engineers
- Sussex County Conservation District
- Sussex County Planning & Zoning
- Sussex County Preservation Planner
- Sussex County Engineering Department
- Federal Highway Administration
- Delaware Geological Survey
- Delaware Department of Agriculture
- The Greater Lewes Foundation
- The Nature Conservancy
- Center for Inland Bays

- DelDOT GIS Department
- DNREC GIS Department

Additionally, the "Inland Bays/Atlantic Ocean Basin Assessment Report" (2001) prepared by Delaware DNREC Whole Basin Management, was also utilized in obtaining environmental information within the study area.

3.0 Results of Screening

This Environmental Screening investigated the existing conditions of a variety of environmental parameters including waterways, wetlands, floodplains, recharge and well-head protection areas, threatened and endangered species habitats, open space and recreation areas, agricultural resources, historic and cultural resources, and known or potential contaminated areas. This information provided an existing conditions environmental base map with which potential land use and transportation alternatives were analyzed. This assessment would then determine which alternatives are environmentally, socially, and economically feasible. In this manner, environmentally sensitive areas could be protected while providing for future development in the most appropriate and acceptable locations.

3.1 Waterways, Wetlands and Floodplains

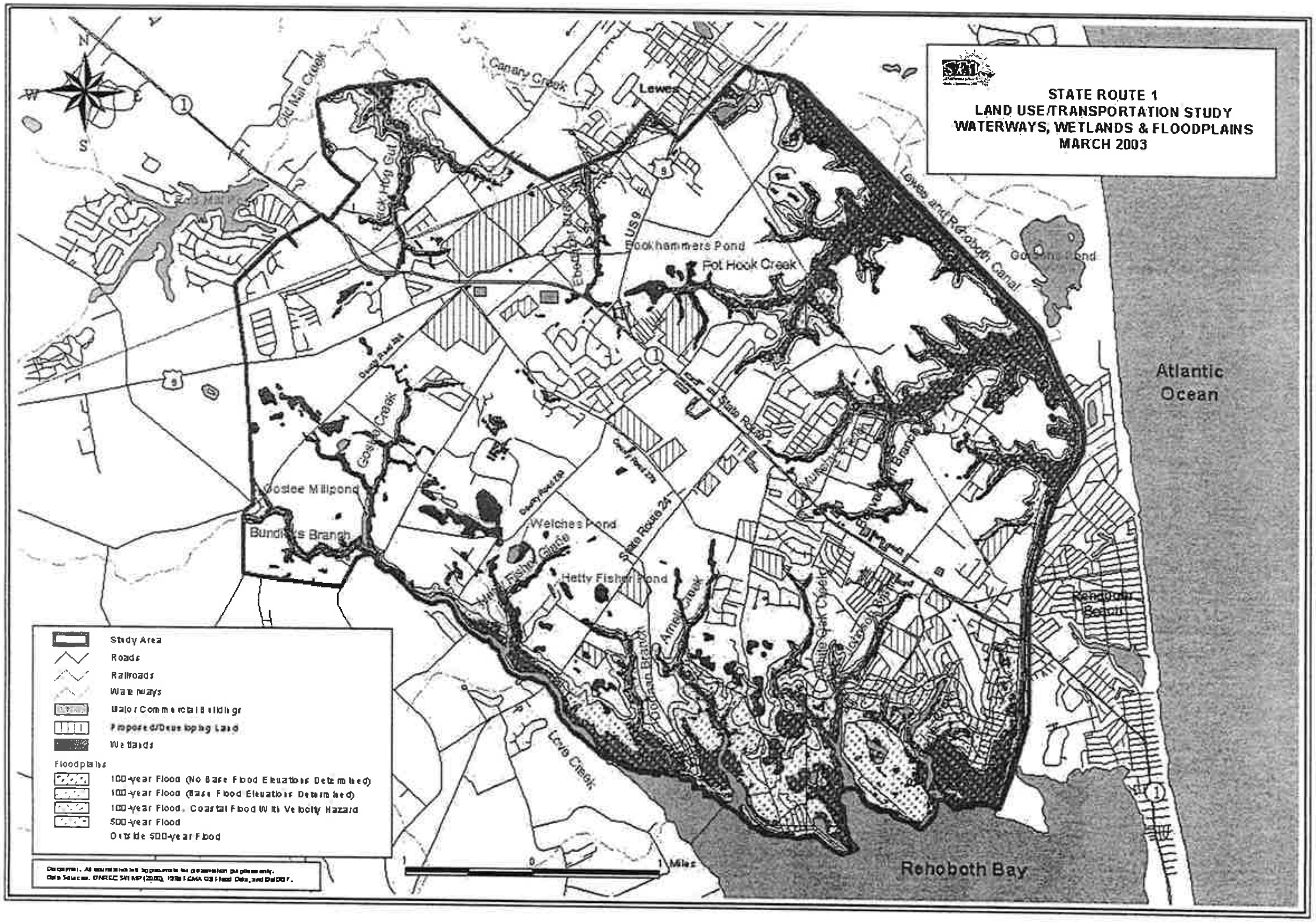
Waterways

The State Route 1 (SR1) study area is a very significant and sensitive environmental area due to its proximity and interaction with Rehoboth Bay, Delaware Bay, and the Atlantic Ocean.

The majority of the study area is located within two watersheds which are both within the Inland Bays/Atlantic Ocean Basin: the Lewes-Rehoboth Canal Watershed is north of Route 1, and the Rehoboth Bay Watershed is south of Route 1. The remainder of the study area north of Five Points is within the Broadkill River Watershed of the Delaware Bay Basin.

The major waterways within the study area include Love Creek, Rehoboth Bay, and the Lewes & Rehoboth Canal. Tributaries within the study area include Bald Eagle Creek, Johnson Branch, White Oak Creek, Arnell Creek, Dorman Branch, Hetty Fisher Glade, Goslee Creek, Bundicks Branch, Black Hog Gut, Canary Creek, Ebenezer Branch, Wolfe Glade, Pot Hook Creek, Holland Glade, Munchy Branch, and Beaverdam Branch among other smaller streams. The major ponds within the study area include Goslee Millpond, Welches Pond, Hetty Fisher Pond and Bookhammers Pond. Mapping of these waterways is provided in Figure ES-1.

Waterways, Wetlands, and Floodplains



Disturbance to any waterway and its beds are under the jurisdiction of the Delaware DNREC "Regulations Governing the Use of Subaqueous Lands". Additionally, the Sussex County Code establishes 50 foot buffers around tidal and non-tidal waterways (mentioned below).

Wetlands

Freshwater and tidal wetlands are associated with these waterways and are abundant along the tributaries to Love Creek, Rehoboth Bay, and the Lewes & Rehoboth Canal. These wetland systems provide many important functions such as providing habitat for diverse plant and animal communities (including endangered and threatened species habitat), flood control, water quality filtration, and aesthetic values. Wetland mapping for the study area produced by the Delaware DNREC 1997 Statewide Wetland Mapping Program (SWMP) is provided in Figure ES-1. The 1997 SWMP mapping displays general areas of freshwater and tidal wetlands for guidance purposes only (are not regulated delineations). These freshwater wetlands, and any impacts thereto, are under the jurisdiction of the United States Army Corps of Engineers. The 1988 State Regulated Wetland (or Chapter 66) mapping provides regulated mapping of tidal wetlands (includes wetlands now or formerly tidal and those lands approximately 2 feet above local mean high water). These tidal wetlands, and any impacts thereto, are under the jurisdiction of the Delaware DNREC.

The Sussex County Code also has provisions regulating disturbance to the buffer areas adjacent to tidal wetlands and non-tidal waterways. A 50 foot buffer zone is established adjacent to tidal waters, tidal tributary streams, tidal wetlands, non-tidal rivers and non-tidal streams. However, although these are the current required minimum standards, it is recommended that buffer areas be extended to at least 100 feet from tidal wetlands and 25 feet from non-tidal wetlands.

Floodplains

Floodplains are located throughout the study area adjacent to the above-mentioned waterways. Floodplains are those areas which tend to flood adjacent to waterways during storm events. A 100-year floodplain is that area of land which tends to flood during the 100-year storm and often includes wetland areas. The 500-year floodplain is that area of land which tends to flood during the 500-year storm and includes the 100-year floodplain. Floodplains are important areas as they provide flood storage capacity which minimizes flooding of upslope and developed areas, provide habitat to many wildlife and plant species, and provide a riparian buffer to their associated waterways . Floodplain areas are depicted in Figure ES-1. Any disturbance to the 100-year floodplain within the study area is regulated by the Sussex County Land Use Code.

3.2 Soils, Geology & Well-Head Protection and Recharge Areas

Soils of the study area consist of two soil associations: 1) the Tidal marsh, salty-coastal beach and dune land association and 2) the Sassafras-Fallsington association. As designated in the Sussex County Soil Survey, the Tidal marsh association consists of "low areas that are regularly flooded by salt water, and areas of loose, salty beach and dune sands". These soils are generally located along the Lewes and Rehoboth Canal, Love Creek, and Rehoboth Bay. The Sassafras-Fallsington association consists of "well-drained and poorly drained soils that have a moderately permeable subsoil of sandy loam to sandy clay loam". This soil association accounts for the majority of the study area.

The study area is within the Atlantic Coastal Plain Physiographic Province. The surficial geology within the study area consists of Holocene Deposits in the area of Wolfe Glade and Holland Glade which are tributary to the Lewes & Rehoboth Canal, and Love Creek and White Oak Creek/Johnson Branch which are tributary to Rehoboth Bay. The remaining surficial geology consists of the Omar Formation (upper unit). The subsurface geology of the study area consists of the Beaverdam Formation and subcrops of the Omar Formation.

Groundwater is the main source of potable water for residents within the study area. This groundwater is provided by three main aquifers: the Columbia Aquifer, the Pocomoke Aquifer, and the Manokin Aquifer. The Columbia Aquifer is the most productive aquifer within the Basin and is an unconfined aquifer which includes all interconnected sands above the first confining layer below the Beaverdam Formation. This aquifer is also called the water-table aquifer system as it is approximately located from the water-table (approximate depth of 9 feet below ground surface) to a thickness of 90-100 feet. Approximately 77 percent of the major public wells in the Basin draw water from the Columbia Aquifer. The yields from the Columbia Aquifer near the City of Rehoboth Beach have been as high as 1,250 gpm; however, the average yield for this aquifer is 240 gpm.

The Pocomoke Aquifer is generally considered to have a "lower sand" and an "upper sand". The "lower sand" has a depth of approximately 106 feet below sea level near the City of Lewes and a thickness of approximately 6 feet near Five Points. The "upper sand" has a depth of approximately 112 feet below sea level and a thickness of 5 feet near Five Points.

The Manokin Aquifer is a confined aquifer the top of which occurs at approximately 170 feet below sea level and is 50-90 feet thick near Lewes. This aquifer yields approximately 40 gpm near Five Points; however, its average yield is 253 gpm. The bottom of the Manokin Aquifer forms the base of the freshwater aquifer system in the Basin as deeper aquifers are too salty, too mineralized, or too deep to be feasible sources of potable water.

There are numerous public water supply wells within the study area. Fifteen of these are large public wells which generate >50,000 gpd which are owned by Lewes, Rehoboth Beach, and Tidewater Utilities. The Delaware Geological Survey has established Well Head Protection Areas (WHPA) for these wells which are their 5-year time-of-travel source water capture zones (see Figure ES-2). An additional 100 meter buffer has also been established around the WHPAs as an additional protection measure.

Groundwater recharge within the study area has been delineated by the Delaware Geological Survey as being excellent, good, fair, or poor. Excellent and good recharge areas are generally located in more inland areas, whereas fair and poor recharge areas are generally located near waterways and waterbodies. The 15 large public wells mentioned above and their associated WHPAs are therefore located, for the most part, within good and excellent recharge areas.

WHPAs and excellent groundwater recharge areas have been designated as Critical Areas in the State Land Use Code by the Delaware Geological Survey. All County Comprehensive Land Use Plans within the State must consider Critical Areas in land use decisions by 2007. The 2003 Sussex County Comprehensive Land Use Plan does mention these Critical Areas; however, does not specify regulations pertaining to them. As a proactive approach, future improvements should be designed so as not to impact Critical Areas.

According to the USEPA and DNREC "Inland Bays/Atlantic Ocean Basin Assessment Report (2001)", the unconfined Columbia Aquifer is recharged by rainwater at an average rate of 193 million gallons per day. Considering the same report estimates the current usage of the Columbia Aquifer within the Basin is approximately 25 million gallons per day and it is estimated that up to 100 million gallons per day can be developed from this aquifer without any adverse impacts, there would seem to be plenty of potable groundwater available. However, being an unconfined aquifer near the surface, the Columbia Aquifer is very vulnerable to contamination via surface runoff infiltration. The constituents of this surface runoff is dependent on the land uses within the area, including shallow septic tanks, agricultural runoff, man-made alterations of natural drainage patterns, and commercial and residential land development.

Therefore, it is recommended that any proposed improvements be conducted in a manner which minimizes, if not avoids, adverse impacts to Critical Areas.

3.3 Threatened & Endangered Species

According to the United States Fish and Wildlife Service (USFWS) and DNREC, there are 30 known species of plants and animals and 3 known communities which are state-listed and 2 known species of animals which are federally-listed: the Bald Eagle and the Delmarva fox squirrel (see Table 1) which are located within the State Route 1 study area. The Bald Eagle (*Haliaeetus leucocephalus*) is a federally-listed threatened species known to nest within the project area, especially in forested areas along waterways. These nest areas are federally protected by the USFWS and development initiatives should be conducted away from such areas. Specifically, no activity is allowed any time of the year within a 750 foot radius circle from the nest tree. Between 750 feet to 1,320 feet outward from the nest tree, there are time-of-year activity restrictions in that no activity is allowed between December 15th – July 1st of each year. The Delmarva fox squirrel (*Sciurus niger cinereus*) is a federally-listed endangered species that potentially inhabits mature forested areas within the study area which have a relatively open understory. Again, any development initiatives should be conducted away from such mature forested areas and in coordination with the USFWS.

TABLE 1
Threatened & Endangered Species Within the Study Area

Scientific Name	Common Name	Global Rank	State Rank	Federal Status
Mammals				
Sciurus niger cinereus	Delmarva fox squirrel			Listed Endangered*
Amphibians				
Ambystoma tigrinum	Tiger salamander	G5	S1	
Hyla chrysoscelis	Cope's gray treefrog	G5	S2	
Hyla gratiosa	Barking treefrog	G5	S1	
Birds				
Ammodramus caudacutus	Saltmarsh Sharp-tailed Sparrow	G4	S1N,S3B	
Cistothorus platensis	Sedge Wren	G5	S1B	
Haliaeetus leucocephalus	Bald Eagle	G4	S2B,S3N	Listed Threatened
Melanerpes erythrocephalus	Red-headed Woodpecker	G5	S1	
Nycticorax nycticorax	Black-crowned Night-heron	G5	S1B	
Fish				
Notropis chalybaeus	Ironcolor shiner	G4	S2	
Insects				
Callophrys irus	Frosted elfin	G3	S1	
Libytheana carinenta	American snout	G5	SH	
Plants				
Bidens mitis	Small-fruit beggar-ticks	G4?	S2	
Coreopsis rosea	Rose coreopsis	G3	S1	
Desmodium obtusum	Stiff tick-trefoil	G4G5	S1	
Drosera rotundifolia	Roundleaf sundew	G5	S2	
Eryngium aquaticum var. aquaticum	Rattlesnake master	G4T4	S2	
Liatris graminifolia	Grassleaf gayfeather	G5?	S1	

Scientific Name	Common Name	Global Rank	State Rank	Federal Status
Lobelia elongata	Elongated lobelia	G4G5	S1	
Sabatia dodecandra	Large marsh pink	G5?	S1	
Utricularia fibrosa	Fibrous bladderwort	G4G5	S2	
Utricularia purpurea	Purple bladderwort	G5	S1	
Utricularia resupinata	Northeastern bladderwort	G4	S1	
Carex exilis	Coast sedge	G5	S1	
Dichanthelium wrightianum	Wright's witch grass	G4	S2	
Eleocharis rostellata	Beaked spike-rush	G5	S1	
Eriocaulon decangulare	Ten-angle pipewort	G5	S1	
Juncus subcaudatus	Subcaudate rush	G5	S1	
Platanthera flava var. herbiola	Southern rein orchid	G4T4Q	S1	
Sacciolepis striata	Gibbous grass	G5	S1	
Sagittaria engelmanniana	Engelmann's arrowhead	G5?	S2	
Sagittaria graminea var. graminea	Grassleaf arrowhead	G5T5	S2	
Communities				
Juncus sp.-Cladium mariscoides-Scirpus cyperinus wetland association	Rush - twig rush coastal plain pond, "Delmarva bay"		S2	
Quercus falcata-Pinus taeda/Ilex opaca forest	Southern red oak-loblolly pine/holly forest		S3	
Quercus falcata-Pinus taeda/Vaccinium sp. forest association	Oak-loblolly pine/blueberry forest		S3	
* = "potentially" within project area according to USFWS (5/15/2002).				

Generally, threatened and endangered species within the study area are located within forested upland and wetland areas near watercourses, specifically Love Creek, Hetty Fisher Glade, Hetty Fisher Pond, Goslee Millpond, Bundicks Branch, Black Hog Gut, Wolfe Glade, Pot Hook Creek, Beaverdam Branch, Bookhammers Pond, Welches Pond, Lewes & Rehoboth Canal, and White Oak Creek (see Figure ES-3). A majority of these lands designated as threatened and endangered species habitats are also designated as significant environmental areas such as State Parks, Nature Preserves, State Resource Areas, or Natural Areas, to name a few. It is therefore important to understand the interconnectivity between E&T habitats and these environmental areas so that future improvements can be planned to avoid or minimize the impact to these areas.

Any potential improvements in the vicinity of threatened and endangered species habitat as demarcated on Figure ES-3, should undergo coordination with the USFWS and the Delaware DNREC Natural Heritage Program to avoid any potential disturbance to the habitat of the above-mentioned state and federally listed species.

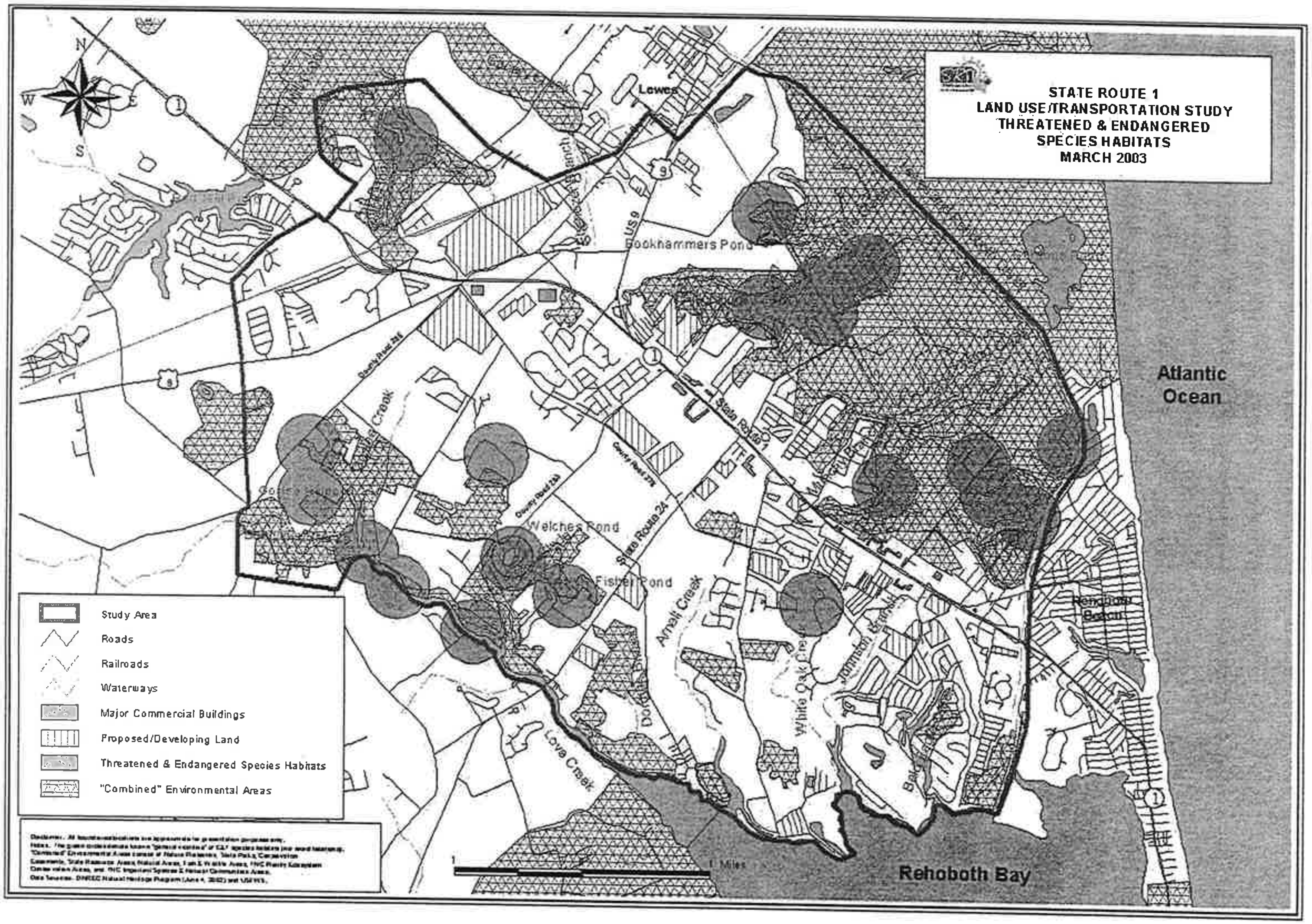
3.4 Open Space/Natural Areas and Recreational Areas

Natural Areas Program

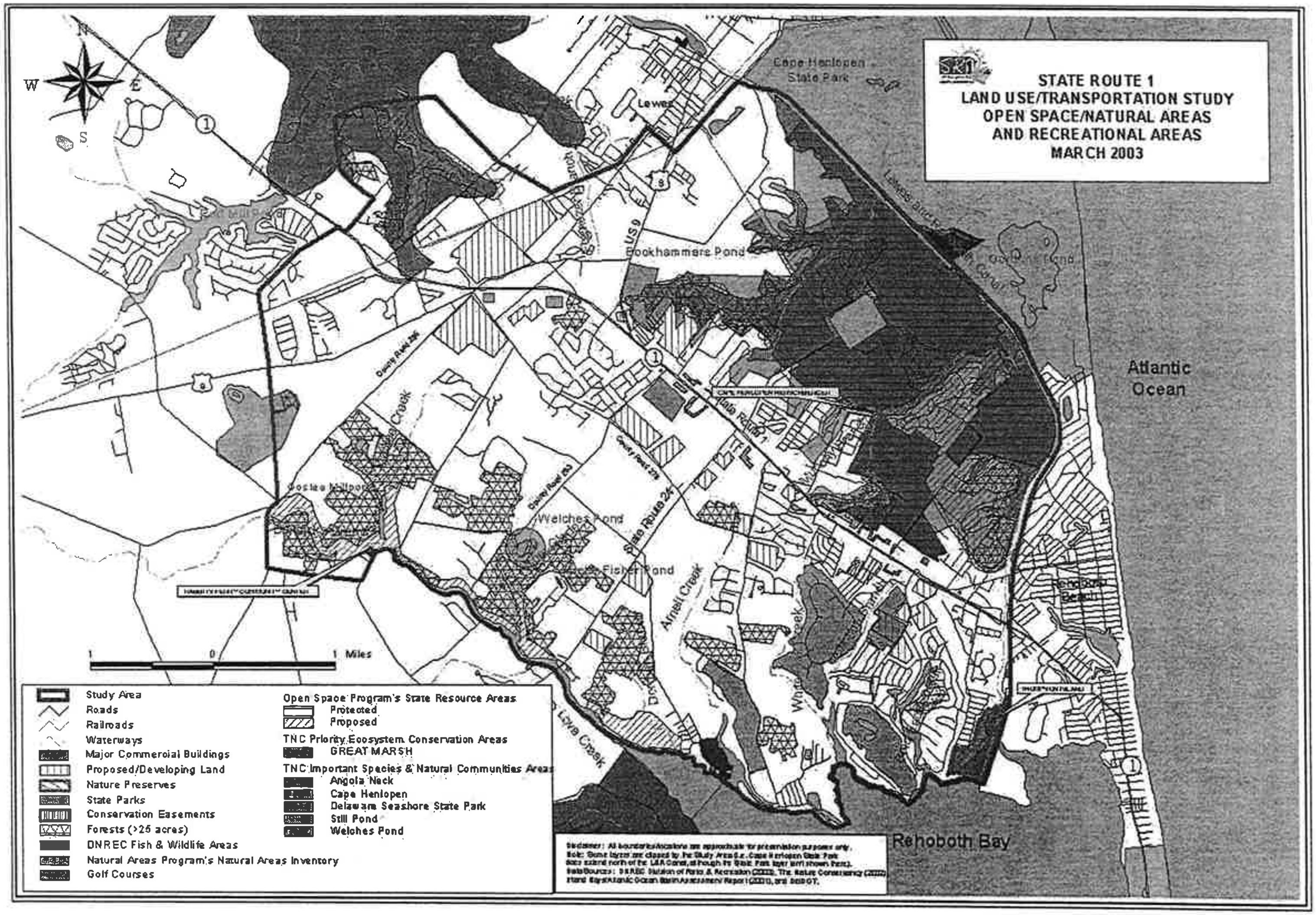
The Delaware Natural Areas Program consists of a Natural Areas Inventory and Nature Preserves. As defined in the Natural Areas Preservation System (*7 Del. Code*, Ch. 73), a "natural area" is an area "of land or water, or both land and water, whether in public or private ownership, which either retains or has re-established its natural character (although it need not be undisturbed), or has unusual flora or fauna, or has biotic, geological, scenic, or archaeological features of scientific or educational value." Those natural areas included in the Natural Areas Inventory must meet the following criteria: representativeness; biological rarity; uniqueness; diversity; size; viability; defensibility; research, education, or scenic value; and outstanding geological, archaeological, or aquatic features. And although an area may meet these criteria, it must be an area of statewide significance to be selected for the Natural Areas Inventory. Natural areas listed on the Natural Areas Inventory within the State Route 1 study area are Cape Henlopen, Great Marsh, Thompson Island, and Angola Neck (see Figure ES-4). Unfortunately, this designation of Natural Area only receives voluntary protection in Sussex County, unlike in New Castle County where protection is not voluntary and the owner must produce a Critical Natural Areas Report for any development project within Natural Areas.

Nature Preserves possess the highest level of legal protection in the state in that permission from both the governor and legislature are required to declassify a natural area as a Nature Preserve. Nature Preserves within the study area include Thompson Island located near the confluence of the Lewes and

Threatened and Endangered Species Habitats



Open Space/Natural Areas and Recreational Areas



Rehoboth Canal and Rehoboth Bay, and the Cape Henlopen Hershberger Tract which is partially located in Cape Henlopen State Park along Beaverdam Branch (see Figure ES-4).

Open Space Program

The Open Space Program was created in 1990 through the passage of the Land Protection Act. This program established State Resource Areas which are areas comprised of federal, state, local, and private lands. The purpose of the Open Space Program is to protect these lands through purchase, donation, or conservation easement acquisitions. Current State Resource Areas designated as "protected" within the study area include portions of Thompson Island and portions of Cape Henlopen State Park (between the Lewes & Rehoboth Canal and State Route 1). "Proposed" State Resource Areas within the study area are located along Love Creek and its tributaries, the Great Marsh Natural Area near Black Hog Gut, portions of Thompson Island, and portions of Cape Henlopen State Park (between the Lewes & Rehoboth Canal and State Route 1).

Conservation Easements

Conservation easements are protected land areas in which the landowner voluntarily places permanent restrictions on its future use. There is one conservation easement within the study area called Rabbit Ferrys Community Center located near Bundicks Branch. A portion of this conservation easement is also a proposed State Resource Area.

The Nature Conservancy (TNC)

One Nature Conservancy "Priority Ecosystem Conservation Area" is also located within the study area. This Priority Ecosystem Conservation Area is Great Marsh which is a high quality saline tidal marsh system in the northwestern portion of the study area near Black Hog Gut. Additionally, Nature Conservancy "Important Species and Natural Communities Areas" within the study area include Cape Henlopen, Welches Pond, and Still Pond. There are no regulations preventing development of these TNC designations; however, correspondence with TNC determined that they would obviously like to see any development within these designated areas avoided or minimized.

DNREC Fish & Wildlife Areas

Two DNREC Fish & Wildlife Areas are located within/adjacent to the study area. The Love Creek Wildlife Area is located along Love Creek near the entrance to Rehoboth Bay and the Gordon Pond Wildlife Area is located along the Lewes & Rehoboth Canal near Gordon Pond within Cape Henlopen State Park.

Recreational Areas

In addition to the natural areas mentioned above which provide many recreational opportunities, such as hiking, biking, birdwatching, etc., there are 6 golf courses within the study area. These include Midway Par 3, Heritage Golf Club, Old Landing Golf Club, Kings Creek Country Club, Rehoboth Golf Park, and the Rehoboth Beach Country Club.

3.5 Agricultural Resources

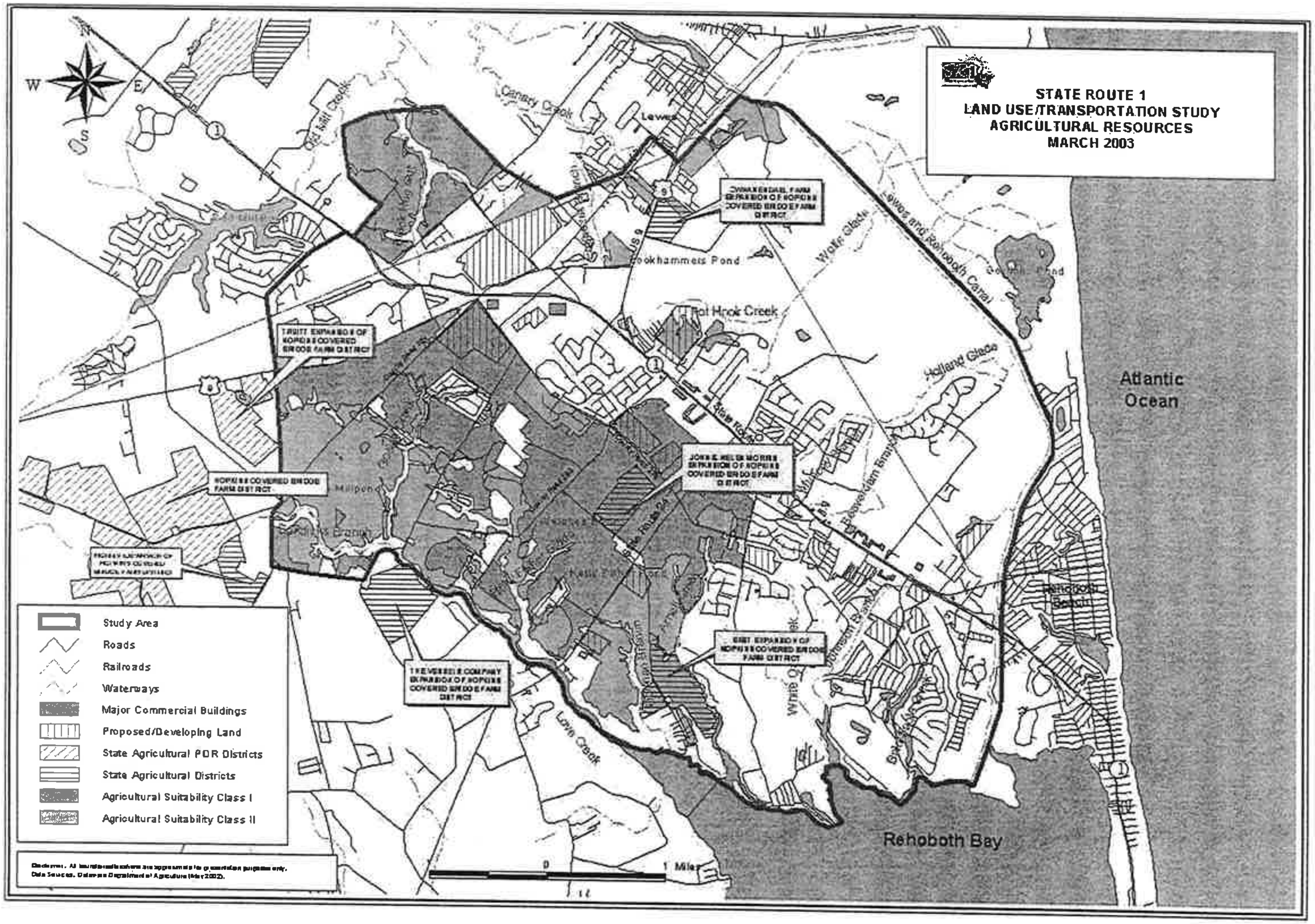
There are many agricultural resources areas within the study area. Agricultural Purchase Development Rights (PDR) Districts are those lands which are permanently protected agricultural easements. A major stipulation of this designation is that they must be farmed and that they cannot sit fallow. Although there are no PDR Districts within the study area, the Hopkins Covered Bridge Farm PDR District does exist in the adjacent areas to the west which are associated with the Agricultural Districts within the project area (see Figure ES-5). Agricultural Districts are lands which are under contract to be preserved for a period of 10 years. Agricultural Districts within the study area include: 1) the Zwaanendael Farm Expansion of Hopkins Covered Bridge Farm District, 2) the John & Helen Morris Expansion of Hopkins Covered Bridge Farm District, and 3) the Best Expansion of Hopkins Covered Bridge Farm District.

Agricultural Suitability classes are designated throughout the study area by the Delaware Department of Agriculture, specifically within the western portion of the study area (see Figure ES-5). These suitability classes denote the suitability of specific land areas for farming. Classes are designated as 1, 2, 3, 4 or 5 depending on whether the land area is rated as very high, high, medium, low, or very low, respectively, as being suitable for farming. Agricultural Suitability is dependent on the soil type and is not greatly influenced by whether or not a house is located on a piece of rural land. It is only when developed land is aggregated in larger communities that results in a lower suitability rating. Class 1 (very high suitability) and Class 2 (high suitability) are the most important Agricultural Suitability classes and should be maintained when possible (see Figure ES-5).

3.6 Historic Resources

The study area is inhabited by many historic architectural and archaeological resources due to the attractiveness of the area to early settlers. Sites categorized as "listed" on the National Register of Historic Places include the Norwood House, located within the Belltown National Register Historic District in the area of Five Points, and many archaeological sites whose address information is restricted for security reasons. National Register Historic Districts located within and adjacent to the study area include the Lewes Historic District which is "listed" on the National Register, the Belltown and Washington Heights

Agricultural Resources



Historic Districts which are "eligible for listing" on the National Register, and the Nassau Historic District which is "potentially eligible for listing" on the National Register (see Figure ES-6).

As previously mentioned, location information regarding the National Register archaeological sites within the study area is restricted for security purposes. However, it can be known that 5 of these archaeological sites are "listed" on the National Register and 1 archeological site is "eligible for listing" on the National Register. The 5 "listed" National Register archaeological sites are the Wolfe's Neck site, the Townsend site, Thompson's Loss & Gain site, Avery's Rest site, and the Warrington site. The lone archaeological resource categorized as "eligible for listing" on the National Register is the Hell's Neck site.

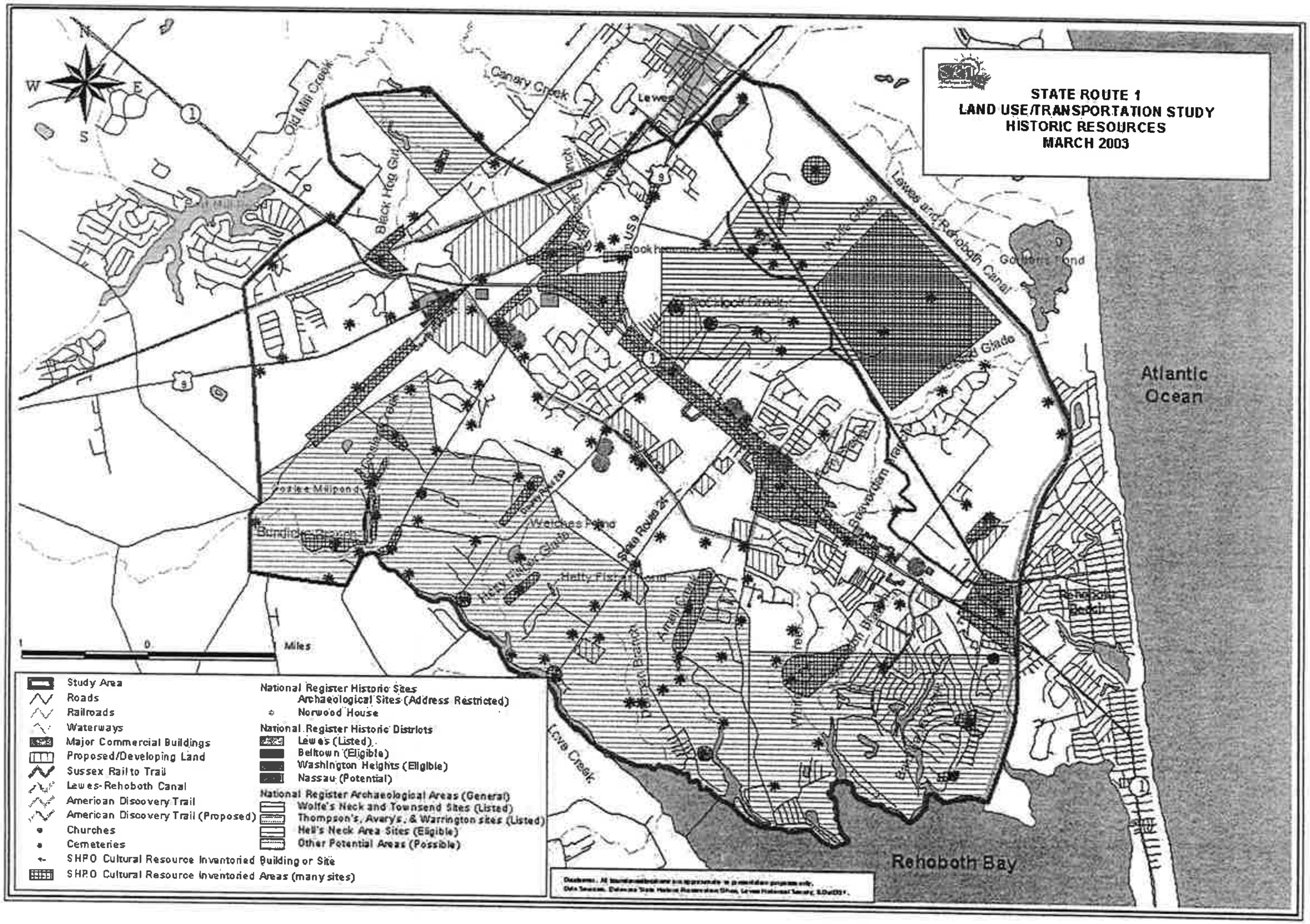
The Delaware State Historic Preservation Office (SHPO) maintains the Cultural Resource Survey (CRS) which includes historic architectural and archaeological resources significant at the federal, state, and local levels. So, although the CRS includes federally significant sites "listed" or "eligible for listing" on the National Register, this survey also includes smaller sites which are important at the state and local level. Many of these CRS sites are historic structures which may or may not have been demolished since the last survey and smaller, lesser known archaeological sites which are often family cemeteries. There are also well-known church and cemetery sites throughout the study area. Due to the many tributaries in the study area which were likely inhabited by Native American communities and the historic agricultural heritage of the area resulting in many farmsteads, there is a very high probability of encountering CRS sites or buildings throughout the study area (see Figure ES-6).

Section 106 of the National Historic Preservation Act of 1966 (NHPA) would need to be satisfied for any improvements with the potential to directly or indirectly affect sites listed in, or eligible for, the National Register of Historic Places. Furthermore, the Federal Highway Administration Section 4(f) Evaluation would need to be conducted for any improvements which may directly or indirectly affect any historical sites and publicly-owned parks, recreational areas, and wildlife and waterfowl refuges.

3.7 Contamination Concerns

There are no federal Superfund sites within the study area. However, there are 7 debris disposal areas/coal gas facilities within the study area which are regulated by the Delaware DNREC Division of Air and Waste Management. Six of these sites are under the jurisdiction of the Hazardous Substance Control Act (HSCA) and one site is under the jurisdiction of the Voluntary Cleanup Program (VCP). See Table 2 for a listing of these sites and Figure ES-7 for their locations.

Historic Resources



Contamination Concerns

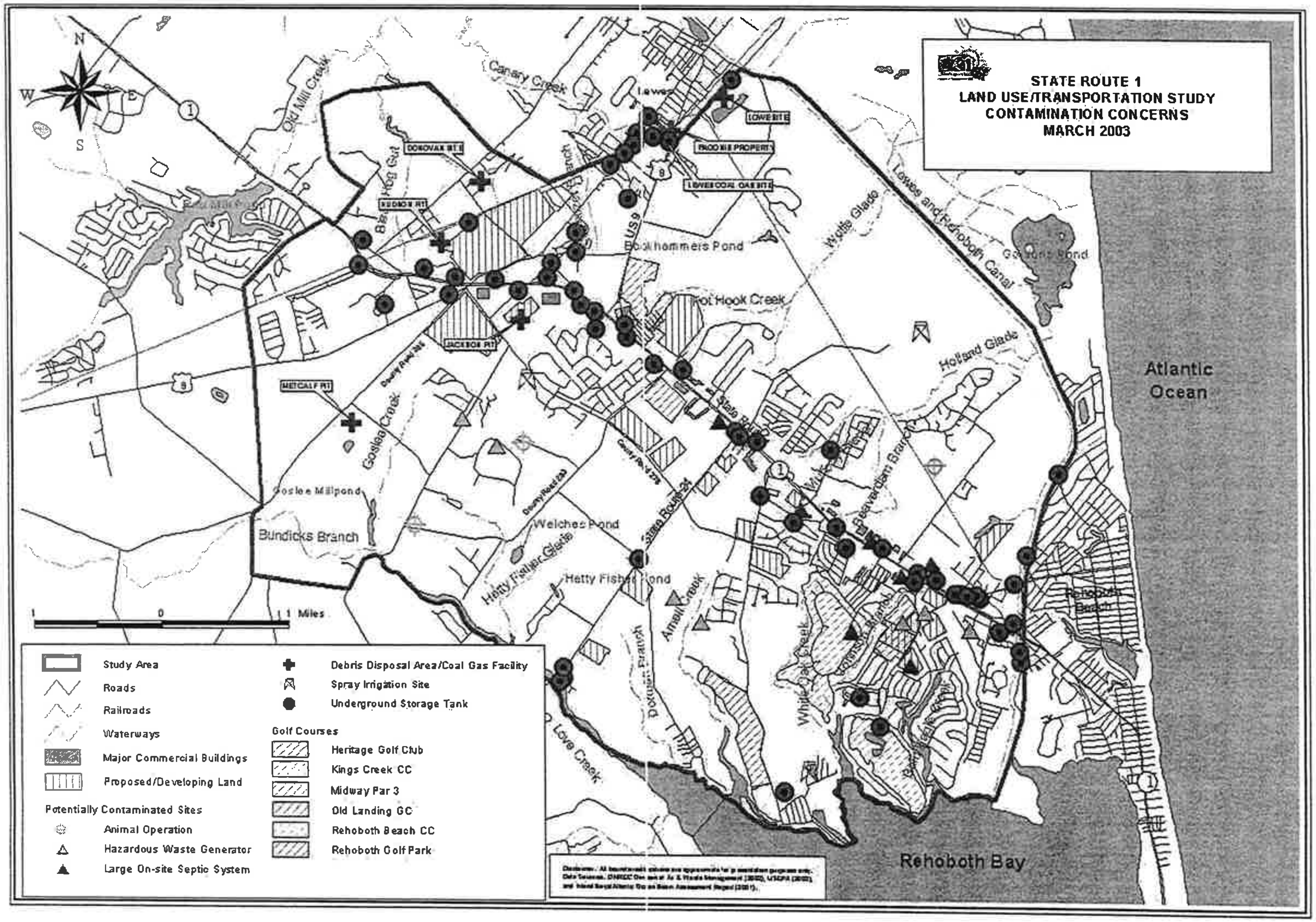


Table 2
Debris Disposal Areas & Coal Gas Facilities
Within the Study Area

Site Name	Site Address	State ID Number	State Program
Donovan Site	Route 269A	DE-0151	HSCA
Hudson Pit	.5 Mile North of SR 1	DE-0107	HSCA – No Action
Jackson Pit	Route 276	DE-0149	HSCA – No Action
Lewes Coal Gas	Kings Hwy off Rte. 9	DE-0190	HSCA – O&M
Lowe Site	Route 9	DE-0217	HSCA
Metcalf Pit	County Road 285	DE-0150	HSCA
Pagonis Property	Kings Hwy	DE-1035	VCP – No Action

Additionally, there are approximately 90 other sites within the study area with former or existing operations which are associated with known or potential contamination issues. These operations consist of animal operations, hazardous waste generators, large on-site septic systems, spray irrigation sites, and underground storage tank (UST) sites (see Figure ES-7). There are also hundreds of small septic systems and 6 golf courses within the study area. Golf courses inherently possess potential contamination issues due to the utilization of fertilizers, herbicides, and pesticides.

4.0 Conclusions and Recommendations

This Environmental Screening Technical Memorandum generally depicts the environmental constraints found within the SR1 study area in order to assist future land use and transportation planning initiatives. Determining these environmental constraints early in the planning process allows for the best protection of the area's natural resources by designing projects which avoid or minimize adverse impacts. Any future improvement would undergo additional environmental scrutiny via environmental permitting and the National Environmental Policy Act (NEPA). Potential improvements within the SR1 study area which involve federal funding or require federal permits (i.e. USACE wetland permit) must be in accordance with NEPA regulations. NEPA compliance requires that a Categorical Exclusion Document, Environmental Assessment, or Environmental Impact Statement be prepared depending on the nature, location and significance of impacts of any such undertaking.

Depending on the nature of any future improvement within the SR1 study area, potentially required environmental permits and approvals may include:

- USACE Section 404 Nationwide or Individual Permit (wetland/waterway impacts),
- USACE Section 10 Permit (structures in/over waterway),
- DNREC Section 401 Water Quality Certification
- DNREC State Regulated Wetland Permit (tidal wetlands),
- DNREC Subaqueous Lands Permit (tidal and non-tidal),
- DNREC Federal Coastal Zone Consistency,
- USFWS Endangered Species Act,
- NHPA Section 106 Review,
- FHWA Section 4(f) Evaluation,
- National Pollutant Discharge Elimination System (NPDES) – Notice of Intent to Discharge Stormwater, and
- Soil Erosion and Sediment Control.

Additional recommendations for any future improvements within the SR1 study area in accordance with the Sussex County Land Use Code, the Sussex County 2003 Comprehensive Land Use Plan (CLUP), the Delaware DNREC Inland Bays/Atlantic Ocean Basin Assessment Report, and as determined by this Environmental Screening Technical Memorandum are as follows:

- Minimum 50 foot buffer around all tidal wetlands as stipulated in the Sussex County Land Use Code, preferably more as proposed in the 2003 CLUP;
- Minimum 25 foot buffer around all freshwater wetlands as proposed in the 2003 CLUP;
- Minimum 50 foot buffer around all non-tidal rivers and streams as stipulated in the Sussex County Land Use Code;

- Floodplain management should be conducted so as not to increase the flood level of the 100-year storm as stipulated in the Sussex County Land Use Code;
- Future improvements should be designed so as not to impact Critical Areas (i.e. wellhead protection areas and excellent groundwater recharge areas) and any associated buffer areas;
- Future improvements should be designed so as not to impact a buffer between 750 – 1,320 feet around nest locations of the federally threatened bald eagle;
- Future improvements should be designed so as not to impact mature, contiguous forested areas as they may provide habitat for the federally endangered Delmarva fox squirrel;
- Future improvements should be designed so as not to impact areas designated as State Parks, Nature Preserves, Natural Areas, State Resource Areas, Conservation Easements, Fish & Wildlife Areas, Agricultural PDR Districts, and Agricultural Districts;
- Future improvements should be designed so as to avoid, minimize or mitigate adverse impacts to historical and archaeological sites of federal, state, and local significance in accordance with the SHPO; and,
- Future improvements should concentrate on redeveloping previously contaminated, previously disturbed properties which have been remediated and cleaned according to DNREC regulations. Reuse of these "brownfields" would encourage development away from pristine "greenfield" parcels thereby preserving those lands and reutilizing previously developed properties.

Furthermore, any potential improvements which may directly or indirectly impact these environmental resources documented in this technical memorandum should be coordinated with the appropriate federal, state, and local agencies.

The SR1 study area encompasses many natural and man-made resources which contribute to the aesthetically pleasing character of this area. Preventing suburban sprawl and encouraging smart growth within this area is intricately dependent on the preservation, conservation and protection of these resources.

State Route 1 Land Use & Transportation Plan

Appendix VI Public Involvement

A. Public Advisory Committee Meeting Presentations and Summaries
B. Public Meeting Presentations and Summaries
C. Public Comment Log

SR1
Land Use & Transportation Study
A joint effort of Sussex County and DelDOT

State Route 1 Land Use/Transportation Study

Technical Memorandum

A. Public Advisory Committee Meeting Presentations and Summaries

Prepared For:
Delaware Department of Transportation

DelDOT

Prepared By:
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516 East State Street
Trenton, NJ 08609

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State Route 1 Land Use/ Transportation Study

Public Advisory Committee Meeting
June 27, 2001

Study Objectives

Working with the Public Advisory Committee and other stakeholders in Sussex County:

- Develop 3 land use scenarios
- Assess the transportation impacts and define the transportation system for each scenario
- Select one land use scenario as the preferred future
- Finalize and prioritize the transportation improvement requirements

Public Advisory Committee Purpose and Role

- Representing their constituencies, inform and advise DelDOT and Sussex County about issues and concerns regarding the study
- Work with them to identify feasible solutions to meet project objectives
- Act as liaisons to "home" organizations – communicate study findings and solicit feedback

Key Issues

- Public involvement/acceptance
- Accommodating local traffic
- Right-of-way availability
- Setting priorities for improvements
- NIMBYism
- Environmental concerns

Methodology for Developing Land Use Scenarios

- Base land use scenario
  - Existing (county) zoning – "build-out" analysis
- Two additional land use scenarios
  - Possibilities
    - Lower/higher
    - Town center

Planning Tools Available

- Synchro Model
  - Assigns development traffic
  - Calculates level of service
- Mapping
  - GIS
  - Aerial
  - Other

Modeling Requirements

- Current traffic counts (background growth)
- Growth of background traffic to 2025
- Future land use (location, size, type)
- Trip generation by land use type
- Future roadway network

Land Use & Transportation Study
A joint effort of Sussex County and DelDOT

State Route 1 Land Use/Transportation Study
Public Advisory Committee
Meeting Summary
June 27, 2001

The meeting began with introductory welcoming statements by Dale Dukes, president of the Sussex County Council, and Ralph Reeb, representing Secretary Nathan Hayward, III, of the Delaware Department of Transportation. A statement was read from State Representative John R. Schroeder, and similar thoughts were expressed on behalf of the other elected officials in the study area. (State Senator Gary Simpson and Sussex County Councilmen George B. Cole and Lynn J. Rogers joined the meeting after if began). Sarah Campbell, a consultant, also explained her role as facilitator.

Individual members of the PAC then introduced themselves and commented on what they hope the study will accomplish. Representative comments included:

- This project should achieve three objectives: solve the transportation problem, save some open space, and provide for orderly growth.
- It's wonderful to see that cooperation between Sussex County and DelDOT is finally here.
- This project should explore all alternatives. The transportation system should serve land use rather than dictate its direction.
- The study should enhance safety and decorum on SR 1, and it should address **all** modes, especially including bicycling. The study should not focus on autos.
- The study should promote less density of development. Tradeoffs regarding development may be necessary to alleviate some of the traffic congestion it generates.
- Land rights and ownership of the land are important, especially to the owners of small farms.
- The area needs more pedestrian facilities. The impacts of this study's recommendations on Route 24 must be considered.
- The study must be careful not to displace traffic from SR 1 onto parallel roads that run through subdivisions.
- The Grid Concept Study appeared to have no numeric base. This study must determine how much traffic will use areas on the grid before recommendations are made.

The PAC co-chairs, Tricia Faust, DelDOT's project manager, and Lawrence Lank, director of Sussex County's Planning and Zoning Commission, presented an overview of the study and its objectives.

Sarah Campbell reviewed the ground rules for the PAC. Tricia Faust clarified that a representative from the Delaware Transit Corporation is a member of the PAC but was unable to attend this meeting, and DelDOT's new bicycle/pedestrian coordinator will be involved in the study but will not be a member of the PAC. The PAC later agreed to add a restriction against ringing cell phones during the meetings (they should be set on vibrate instead). The PAC also requested that a representative from the Delaware State Police be added to its membership so that public safety would be better represented. Sussex County and DelDOT agreed to pursue this subject. (A member of the Lewes Fire Department was also present). A list of all PAC members, including their e-mail addresses if available, will be sent to all members, and they will be identified in the first study newsletter, which will be distributed before the first public meeting on August 15, 2001. The group agreed to meet from 6:30 to 9:00 on the two dates indicated on the meeting agenda – September 19 and October 24, 2001.

Mel Lehr and Marge Quinn, consultants, then reviewed both the technical and public involvement activities in the scope of work. A PAC member indicated that he believes the PAC needs to be able to look at the following to do its job:

- The Sussex County Long-Range Transportation Plan
- The current Capital Improvement Program, which indicates when new projects will come on line and thus when they can be expected to provide relief
- Any new developments in the study area that could affect whether projects can be implemented.

A PAC member asked about FHWA's involvement in the study. Ralph Reeb replied that representatives of FHWA (and FTA when appropriate) are kept continually aware of project developments throughout the entire process and their advice is solicited, through a process referred to as streamlining. They will also review study documents.

A PAC member asked if the study will also consider the effects of the project on the economy (local economic development, tourism, etc.). Although the study team will solicit the input of the Sussex County Department of Economic Development and other appropriate sources, this is not a focus of the effort.

A discussion about the planned public workshops revealed the following viewpoints:

- The workshop format doesn't work – very few attend.
- People want a presentation, not just an open house where they can talk to study team members on an individual basis.
- More than one presentation in a session makes hearing what everyone has to say and interacting with them difficult.
- These meetings should not be termed "workshops."

Participants were asked to forward appropriate mailing lists to the study team to ensure the project mailing list is as inclusive as possible.

Several PAC members also suggested that the best way to reach the general public is to take a presentation to homeowners' associations, local churches and civic groups, etc., rather than expecting the public to come to separate meetings to learn about the study. A member of the general public volunteered to provide the study team with a list of stakeholders she thinks they should contact.

Some PAC members would like to see a Mission Statement to clarify the goals of the study and their role in it. The PAC also agreed that the study limits should be referred to as Lewes to Rehoboth/Dewey Beach in material for the public.

ACTION ITEMS

- PAC members will share information with the groups they represent, as appropriate.
- PAC members will identify organizations that should be added to the study mailing list for announcements of public meetings and newsletters.
- Sussex County and DelDOT will circulate an updated list of PAC members, including e-mail addresses, to all members.
- Sussex County and DelDOT will draft a mission statement to be presented at the next PAC meeting.
- Sussex County and DelDOT will develop a fact sheet about the study area, including economic impacts.
- The ground rules will be revised to prohibit ringing cell phones.

The next PAC is scheduled for Wednesday, September 19, 2001.

State Route 1 Land Use/ Transportation Study

Public Advisory Committee Meeting
September 19, 2001

A Joint Effort of:

Sussex County
and the
Delaware Department of
Transportation DelDOT

Follow-Up From Prior PAC Meeting

- Revised Ground Rules
- Relationship to Comprehensive Plan
- PAC Discussion and Agreement Mission Statement

DelDOT

Public Information Meeting

- The public has shown great interest in the study
  - 93 people attended the 1st public information meeting
  - 18 of them were PAC members or PAC invitees!
  - Our mailing list and comment/issues log has grown and continues to grow

DelDOT

Major Themes We Have Been Hearing

- The public is very concerned about the impacts on traffic of existing and proposed development.
- They are eager to see something done now.
- Most comments have focused on SR1 – Five Points, entrance to Rehoboth/Dewey, etc .
  - Suggested solutions include parallel service roads, overpasses, bypasses, use of Rt. 113
- There is general support for a grid system as a concept.

DelDOT

Major Themes We Have Been Hearing

- People looking for more information on how grid concept would improve situation.
- Congestion at intersections is a major concern.
- Many believe land use planning is the key.
- Many look forward to more/better bicycling/pedestrian facilities.

DelDOT

Revised Public Meeting Schedule

- Revised schedule to have next public information meeting in December, not March
  - Maintains high interest level
  - Allows PAC and team to gain feedback earlier as elements of the technical work are completed and recommendations formulated
- Mark your calendars for December 5th!

DelDOT

Defining the Problem

- PAC Discussion and Agreement on Problem Definition statement

DelDOT

Overview of the Methodology for Travel Demand Modeling

DelDOT

Land Use Scenarios

Land Use Scenarios

- Scope of Work calls for the examination of three land use (development) scenarios – a base and two alternatives
- For all scenarios:
  - Forecast future year travel
  - Use models to predict where this traffic would travel and how well it would flow
  - Provides an indication of where improvements are needed in the future

Base Land Use Scenario

- Base Land Use Scenario represents the "base case" for the study; a benchmark
- Base Land Use Scenario includes currently in place development, new development under construction and proposed development in the review process (both residential and commercial)
- Represents what is most likely to happen

Alternative Land Use Scenarios

- Discuss possibilities for alternative scenarios
  - Base scenario plus all vacant and currently farmed land built-out under current zoning
  - The above at a greater or less percentage based on density
  - An alternative form of development – new town center
  - Others ideas?
  - Homework Assignment!

Next Two PAC Meetings

- **November 14, 2001**
  - Initial Traffic Impacts of Base Land Use Scenario
  - Decision on Additional Land Use Scenarios
- **January 23, 2002**
  - Review 3 Land Use Scenarios
  - Traffic Impacts of the 3 Scenarios

Additional PAC Member Comments

Public Comment

Next Steps

- Attend the December 5, 2001, Public Information Meeting at the Officer's Club at Cape Henlopen State Park
- Mark your calendars for this meeting

State Route 1 Land Use/Transportation Study
Public Advisory Committee
Meeting Summary
September 19, 2001

Following a brief introduction, the PAC reviewed the revised ground rules and approved the proposed PAC Mission Statement. Lawrence Lank explained that the schedule for this study has been slightly adjusted to ensure that its findings can be incorporated in the mobility section of Sussex County's updated Comprehensive Plan, due to be completed by October 1, 2002.

A PAC member asked whether funds have been allocated to this project. A detailed discussion about how projects in general are funded followed. Although DelDOT has allocated approximately $30 million for the projects that resulted from the 1999 Grid Concept Study, no money has been earmarked for projects that could result from this study. Once individual projects have been identified and prioritized at the end of this study, they will be advanced to the Project Development group at DelDOT, which will develop these projects in greater detail, including estimating their costs to implement. DelDOT will then consider these projects in the greater context of Sussex County's overall needs and the needs of the state as a whole. Those projects that are considered to have the greatest priority statewide will then be included in DelDOT's Capital Improvement Program. A representative from the Federal Highway Administration added that FHWA allocates approximately $130 million in federal funds to DelDOT each year, and DelDOT decides where that money will be spent. Consideration of each project's impacts is required when a project moves through the funding pipeline.

PAC members reviewed the proposed Problem Statement for the study and agreed that it requires more explicit attention to a number of issues, including: the need to develop a land use plan, ensure safety, provide for orderly economic development, protect open space, and maintain the character of the study area. The Problem Statement has been revised to incorporate suggestions from the PAC.

Bruce Allen of DelDOT made a presentation of the model to be used to forecast travel in the study area. This model will be used to determine the traffic impacts of each of the study's land use scenarios. The PAC then turned to a discussion of land use scenarios. The Base Case Land Use Scenario has been developed and its travel implications are being identified and analyzed. This scenario includes current land uses, new development under construction, and proposed development already in the review process for both residential and commercial uses.

The study scope will examine two other land use scenarios. PAC members were asked to suggest alternatives. Possible scenarios suggested included:

- Assume that X% of currently undeveloped land is set aside as open space (possibly 10-20%).
- Base a future scenario on historical development patterns (growth and density) for the past 30 years.
- Assume a maximum build-out using existing zoning (considering any constraints imposed by Sussex County's Sewer Plan). This scenario would also have to take into account how much of the area cannot be developed because of environmental or other limitations.
- Develop an off-season scenario that focuses on only the travel generated by local residents. Some PAC members suggested that this might not be entirely useful since the number of year-round residents is expected to increase significantly. In addition, the six months that now constitute the tourist season are a major inconvenience and affect the ability to provide timely emergency services.
- Consider where the development will take place in the study area and whether an alternative form of development such as a town center would be appropriate.

In response to questions about the effects of the proposed improvements to Route 113, Bruce Allen said that DelDOT will do model runs to see what would happen if that corridor were upgraded to a limited access highway.

Maureen Mauger, DelDOT's project engineer for a new study of the State Route 24 corridor, briefly described that effort, and Don Plows, DelDOT's project manager for the Grid Study projects, was introduced. PAC members were invited to discuss these separate projects with these representatives after the meeting.

Action Items

- Consider the alternative land use scenarios described above, and any possible scenarios, in preparation for a discussion at the November 14 meeting about which scenarios the study team should pursue.

The next PAC meeting will be held the Officers Club (Cape Henlopen State Park) on Wednesday, November 14, 2001, at 6:00 pm.

State Route 1 Land Use & Transportation Study

Public Advisory Committee Meeting

November 14, 2001

DelDOT

Meeting Overview

- Learn tonight about:
  - The results of the Base Land Use Scenario – concepts & terms
  - How land development patterns affects transportation
- Provide comments on other possible land use scenarios and reach consensus
- Why? So the PAC can help shape the study
- Ultimately, help to shape growth in the region

Review of Base Land Use Scenario and Draft Map

Base Land Use Scenario & Draft Map

- "Base case" for the study - a benchmark for transportation system performance
- Includes:
  - Currently in place development
  - New development under construction
  - Proposed development in the review process (both residential and commercial)
- Represents what is most likely to happen over the short-term

Overview of SR1 Travel Study Methodology

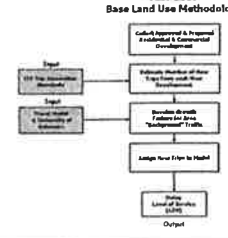
SR 1 Study Travel Model Methodology

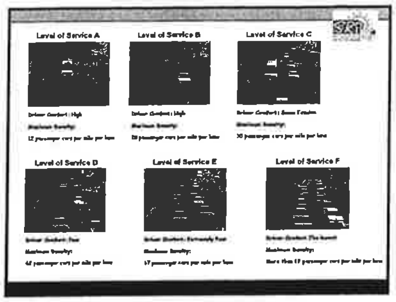
- ☑ (1) Collect data regarding traffic counts and other information about the roadway system in the Study Area.
- ☑ (2) Collect data from Sussex County on existing, approved, and proposed residential and commercial land development in the Study Area.
- ☑ (3) Estimate where and how many new vehicle trips will be added to the roadway system with future development.
- ☑ (4) Build traffic simulation model representing Base Land Use Scenario.
- ☑ (5) Analyze traffic impacts of Base Land Use Scenario.
- ☑ (6) Report findings to Public Advisory Committee (PAC) and public for review and comments.
- (7) Analyze traffic impacts with additional land use scenarios

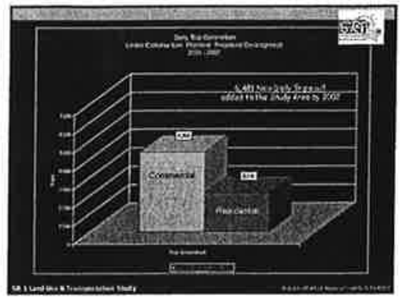
Travel Demand Analysis

- 1998 volumes compared to 2007 forecasted volumes (base land use scenario)
- Compare signalized intersection level of service (LOS) in 1998 to 2007
- Seventeen signalized intersections in study area, most along SR 1
- Level of service at signalized intersections:
  - A measure of the general acceptability of delay to drivers
  - Scale from LOS A, where an intersection would have little or no delay to LOS F, for an intersection with unacceptable delays

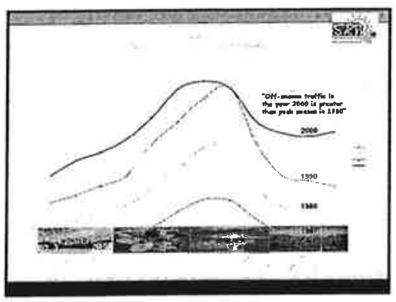
Year 2007 Base Land Use Methodology

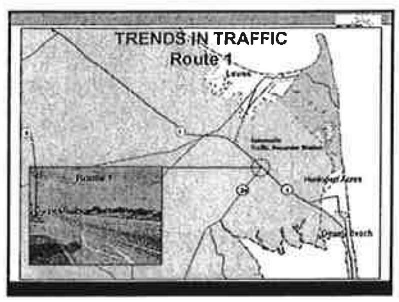


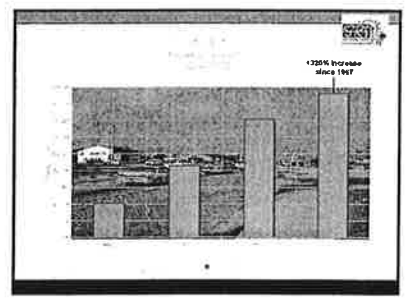


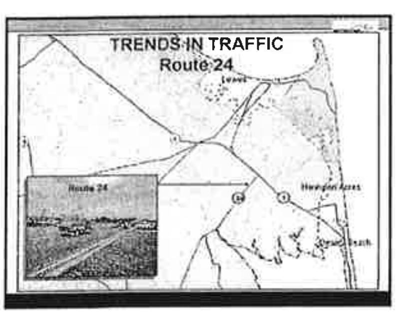


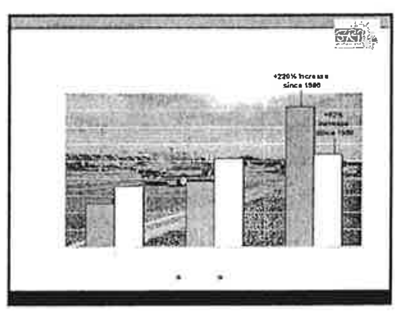
Trends in Study Area Traffic











Travel Model Results for Base Land Use Scenario

Results

- Overall performance of all signalized intersections within study area deteriorate
  - Lengthier delays and longer queue lengths in 2007 than 1998
  - Due to increases in through volumes and significant increases in local traffic either generated or attracted by area development
- Major collectors and arterial streets feeding local traffic to SR1 will experience longer delays and queues (failing LOS in 2007 for many of the movements from most of these roads)

Results (cont.)

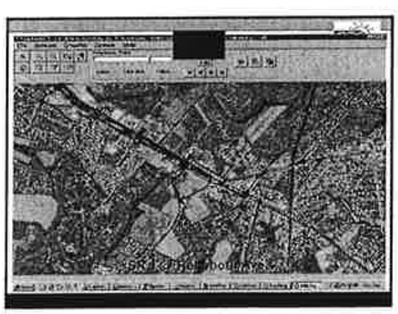
- Area has absence of alternative streets running parallel to SR1 for entire length
- No major street running parallel to SR1 to the north; Plantations Road (Rd275) runs parallel to SR1 to the south but does not cover entire length of study area
- The traffic analysis for Plantations Road indicates that the signal at SR24 will have failing LOS (E) mainly due to traffic volumes on Plantations Road
- Increased volumes will deteriorate the LOS for the unsignalized intersections on Plantations Road too

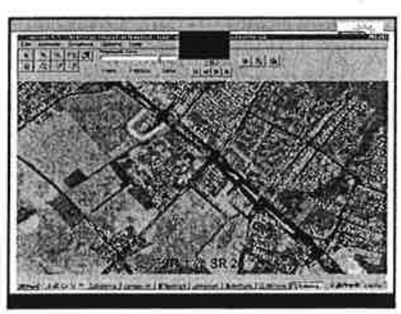
Results (cont.)

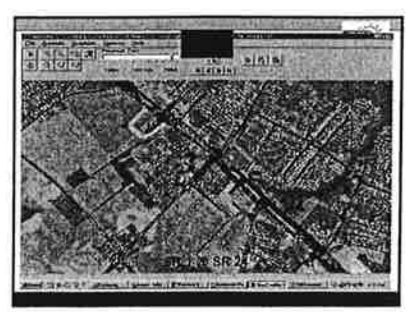
- Movement of local traffic greatly affected in 2007 by considering only the currently proposed or under construction properties
- Five signalized intersections operate at LOS E or F in 1998
- By 2007, eight signalized intersections will operate at LOS E or F
- Six signalized intersections are operating at acceptable LOS but their LOS will deteriorate closer to failing levels (from LOS A or B to LOS D)
- Only 3 signalized intersections will continue to operate at the same acceptable LOS in 2007

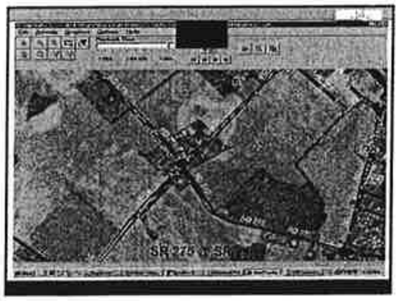
Signalized Intersections With LOS E or F

1998	2007
Rt 18 & 285B (LOS F)—near Belltown	Rt 18 & 285B (LOS F)
Rt 18 & SR 1 (LOS E) — at 5 Points	Rt 18 & SR 1 (LOS F)
SR 1 & Dartmouth Drive (LOS F) —near Savannah East Apartments	SR 1 & Dartmouth Drive (LOS F)
SR 1 & Munchy Branch Rd (270A) (LOS B)	SR1 & Munchy Branch Rd (270A) (LOS E)
SR 1 & Camelot (LOS D) —near Cracker Barrel	SR1 & Camelot (LOS F)
SR1 & Rehoboth Ave (SR1A) (LOS F) —entrance to Rehoboth Beach	SR1 & Rehoboth Ave (SR1A) (LOS F)
SR1 & Bay Vista Rd (273A) (LOS F) —near Eagle Landing	SR1 & Bay Vista Rd (273A) (LOS F)
SR 24 & Plantations Road/Rd 275 (LOS D)	SR 24 & 275 (LOS E)





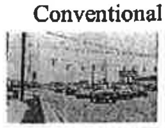




Discuss Possibilities & Reach Agreement on Alternative Land Use Scenarios

How Do Development Patterns Affect Transportation?

Conventional Suburban Design



- Development pattern for last 5 decades
- Typically low-density single family housing
- Separate uses
- Auto dependence
- Congestion
- Discourages walking, biking and transit use
- Voracious land consumption

Conventional Suburban Design

- A suburban cul-de-sac impinges upon farmland.
- Efforts to protect farmland are important both economically and environmentally.

Traditional Neighborhoods & Villages

- Mix land uses
- Design is at a pedestrian scale
- Create walkable & bikeable neighborhoods
- Create housing opportunities & choices
- Provide transportation choices
- Reduce dependency on automobile

Conventional Suburban Design – Its Effect on Transportation

- All trips need to use the arterial highway.
- Transit stops are engulfed by parking lots or are along highways unfriendly to walk along or cross; makes transit inconvenient to use.
- Long distances and separated land uses, discourage walking and biking.

Traditional Development – Its Effect on Transportation

- Local trips do not need to enter the arterial highway.
- A system of interconnected streets link land uses; provide multiple travel paths.
- Shorter distances encourage walking and biking to destinations.
- Using transit can be more convenient: people will walk a ¼ mile to a bus, walk up to ½ mile to rail.

Comparison

- Similar land uses arranged in different development pattern
- Traditional Design
  - Lower per capita VMT
  - Shorter travel times
  - Lower emissions
  - Varying results on congestion
  - Reduced infrastructure costs
  - Helps encourage use of transit, biking and walking

Possible Alternative Scenarios

Last PAC Meeting Ideas

- Assume X% of currently undeveloped land is set aside as open space (possibly 10-20%)
- Use historical development patterns (growth & density) over past 30 years
- Use build-out of existing zoning (reflect sewer and environmental constraints)
- Develop off-season scenario (only travel generated by local residents)
- Consider where development will take place and alternative form of development (town center)

Possibilities for Scenarios

Possibility
Land in Development District develops at 4du/acre; other land develops per zoning (@2du/acre)

Possibility
All land in study area considered Development District

Possibility
Development District develops at 6du/acre; other land at 1du/acre

Possibility
All of these, some of these, others?

2025

Base Land Use Scenario
•Existing Development & Development Proposed or Under Construction
•Represents What Is Most Likely to Occur in Study Area over the Short Term
•Serves as a Benchmark for Comparing Other Scenarios

2007 & 2025

Zoning Categories

Zone	Name	With Central Sewer	With Septic
AR 1	Agricultural/ Residential	2 du/acre Zoning for most undeveloped & farmland in study area	2 du/acre
MR	Medium Residential	4 du/acre	2 du/acre
GR	General Residential	4 du/acre	2 du/acre
HR	High Density Residential	12 du/acre	2 du/acre
B1	Neighborhood Business	Retail shopping & personal services for nearby residential neighborhoods	
C1	Commercial	Commercial uses serving community wide area or region wide for large scale	
RPC	Residential Planned Community	Large-scale residential development with related commercial use	

Future Growth –How Should It Occur?

- What land use scenarios should be analyzed?
  - Discuss Possibilities
  - Reach Consensus on Scenarios

Next Public Information Meeting

Public Information Meeting

- December 5, 2001 at Cape Henlopen Officers Club
- Format
  - Open House (5 to 7:30PM) with scheduled presentation
- Agenda
  - Study Overview: Objectives, Problem Definition, Scope of Work, Schedule, PAC Membership & Mission
  - Draft Grid Concept Network and Land Development Map
  - Land Use Scenarios
  - Current Traffic Conditions
  - Traffic Impacts of Base Land Use Scenario

Next Two PAC Meetings

Next Two PAC Meetings

- January 23, 2001 – 6:00PM Cape Henlopen Officers Club
  - Public Meeting Results
  - Review of the 3 Land Use Scenarios
  - Initial Transportation Impacts
- March 27, 2001 – 6:00PM Cape Henlopen Officers Club
  - Public Meeting Results (@March 6, 2001)
  - Complete Review of Transportation Impacts

Additional PAC Member Comments

Review of Action Items

- Any from meeting?
- Additional material for PAC to take and distribute

Public Comments

State Route 1 Land Use/Transportation Study
Public Advisory Committee
Meeting Summary

November 14, 2001

This meeting began with a description of current traffic trends, the traffic implications of the base land use scenario and a discussion about how land development patterns affect transportation. It then focused on identifying the land use scenarios to be modeled and analyzed as part of this study.

The base land use scenario includes all current residential and commercial development, new development under construction, and proposed development that is now in the review process. It represents what is most likely to happen over the short term (by 2007). When this scenario is projected to 2025, it will represent what is likely to happen if no more development occurs beyond what is planned.

The traffic implications of this scenario were then presented to the PAC. The study team analyzed 17 signalized intersections in the study area to determine the effects of existing and planned development (the base case). The results show a significant deterioration in traffic flow by 2007, with lengthier delays at traffic signals and longer backups. Only three of the 17 intersections will operate as well as they do today in 2007. Further analyses are expected to show even more serious congestion in 2025 if nothing is done.

The study team then presented a range of possible alternative land use scenarios that could be analyzed at part of this work. These scenarios are central to this study since transportation improvements will be identified to serve them. Different land uses generate different numbers and types of trips. The possible land use scenarios identified include:

- Scenario #1
  Assume that the current land use plan remains in effect. Under this scenario, all land in the Development District designated by Sussex County's Comprehensive Plan would be developed at a density of four dwelling units per acre. Land outside the Development District, which is

mostly west of SR 1, would be developed at a rate of two dwelling units per acre. This level of density would support only limited public transit.

- Scenario #2
  Assume that all land in the study area is considered part of the Development District. This would mean that all vacant land would be developed to its full capacity – four dwelling units per acre. The land east of SR 24, which is environmentally sensitive, would be developed at a rate of only one dwelling unit per acre.
- Scenario #3
  Assume that development in the Development District is clustered into neighborhoods or "villages" at a density of six dwelling units per acre with connections among them; land outside the District would be developed at a density of one dwelling unit per acre. This scenario possibly supports transit service.
- Scenario #4
  Open for suggestions

After much discussion, some PAC members suggested that the study team should model the effects on traffic of all three of the detailed scenarios described above. (No one suggested a Scenario #4.)

The portions of the meeting set aside for additional PAC member comments and comments from the public focused on how the grid concept developed in the previous study would be used with these scenarios. The study team emphasized that the grid concept is not related to the development of alternative land use scenarios. If the grid concept appears to benefit the transportation system that is identified as necessary for the land use scenario ultimately adopted by Sussex County, portions will be included in the recommendations.

In follow-up discussions between Sussex County and DelDOT, it was agreed that an information meeting for PAC members would be held at the Officers Club (Cape Henlopen State Park) on Wednesday, December 5, at 6:00 pm. The next PAC working meeting will be held at the Officers Club on Wednesday, January 23, 2002.

State Route 1 Land Use & Transportation Study

Public Advisory Committee Information Meeting

December 5, 2001

DelDOT

Why This Meeting?

- PAC appears:
  - uncomfortable with pace of study at present
  - unclear about how work in the study will be undertaken
  - unsure about where study is going
- As a result:
  - Postpone Public Information Meeting
  - Use the time for the PAC to gain greater understanding of study and their role in it

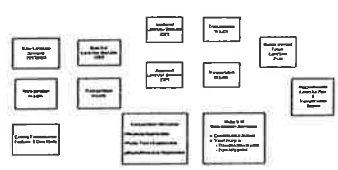
Meeting Purpose

- Ensure that the PAC has a more thorough understanding of the project
- Raise comfort level of PAC with project – the tools and where it is going
- Let members ask questions more informally in a small group or one-on-one situation
- Not make decisions tonight

How Meeting Will Work

- Have Presentation on:
  - The project: What are steps in the process? Where are we heading?
  - How we plan to identify and analyze future year travel demand: What do we mean by land use? What are scenarios? What is trip generation & how is it calculated? How do we forecast where these new trips will go? What are the results and how will they be analyzed?
- Break Out into Stations for Displays, Questions & Answers
- Regroup to Assess and Take Next Steps

Project Process Flow Chart



Role of PAC in the Project

- Work with DelDOT and Sussex County to identify feasible solutions to meet project objectives. This means helping to:
  - define land use scenarios
  - react to transportation impacts
  - recommend a land use scenario as the preferred future
  - recommend the transportation system to support this preferred future
- Inform and advise DelDOT and Sussex County about issues and concerns regarding the study
- Act as liaisons to "home" organizations – communicate study findings and solicit feedback

Land Use and Land Use Scenarios

- Land Use – The activity that occurs on a piece of property – residential, commercial/retail, industrial, agricultural, etc.
- Why is this important to a transportation study?
  - Travel is a derived demand: people travel for a reason – to a place and from a place – to work, to friends/family, to shopping, to recreation, to place of worship, etc.
  - Various uses generate or attract different amounts of travel and at different times

What is a Comprehensive Plan? What is Zoning?

- Comprehensive plan: a long-term plan (20-30 years) for the overall physical development of an area. Sets forth goals and policies to achieve them. Has many elements (land use, mobility, water & sewer, recreation, etc.)
- Zoning: legal ordinance that regulates land use & the height and bulk of buildings; divides land into districts where the regulations are uniform.

What is the Current Land Use Plan for the Study Area?

- Land bordering SR 1 (+/- 600 feet both sides): growth area (for regional/community-wide commercial)
- Land northeast of SR 1: growth area (higher residential densities [4 dwelling units/acre], commercial & industrial uses)
- Land southwest of SR 1: growth areas
  - Between SR1 and Plantations Road
  - Area east and west of Old Landing Road
- Other land in study area: agricultural; not designated for growth

What is the Zoning for Land In the Study Area?

- Land +/- 600 feet of SR 1 is zoned for commercial uses
- Most other land is zoned AR-1 for agricultural or residential uses. Residential uses at 2 dwelling units/acre.

What Are Land Use Scenarios?

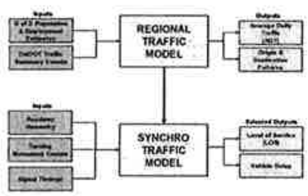
- When we use the word "scenarios," we mean different ways that land in the study area that is not already developed could be developed in the future.
- Scenarios represent possibilities for the future.
- Scenarios allow us to examine "What Ifs?"
  - What happens to transportation if non-developed land in the study area develops according to the current land use plan & zoning ordinance?
  - What happens to transportation if non-developed land develops at greater or lesser densities than allowed in the current land use plan & zoning ordinance?

What is "Build-Out"?

- When we use the word "build-out" we mean that land development will continue until there are no more parcels to build on.
- Different scenarios would produce different "build-outs" in terms of number of housing units, square feet of commercial space, etc.

Trip Generation

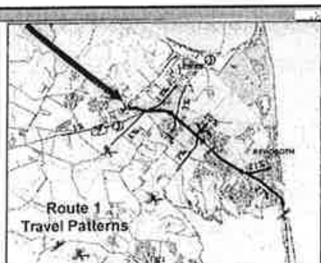
Year 2007
Base Land Use Methodology



Trip Generation

GOAL:

"To develop a long range analysis that provides an indication of future demand, the type, and severity of possible deficiencies in the transportation network that will form a framework for the development of solutions"



Trip Generation
Base Land Use Scenario (2007)

Residential & Commercial Developments:

Steps:

#1 - Identify total number of lots and / or type of zoning, area of each property, and establishment type from Sussex County Tax Parcel maps.

#2 - Identify proper ***Institution of Transportation Engineers (ITE) Trip Generation Manual*** code based on establishment type.

#3 - Calculate total number of entering and exiting trips using average rate equation for that ITE code for Saturday peak hour of each establishment.

Example: Residential

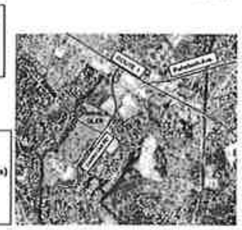
Tax parcel 3.01/6/5 on Sussex County Tax Parcel Map #3-34-19 indicates a proposed 125 single-family lot development.

ITE code 210 (single-family detached housing)

Thus:

Total # of trips generated = (number of dwelling units) x (average rate of trips)

= 125 x 0.94
= 118 total trips



Example: Commercial

Tax parcel 352 on Sussex County Tax Parcel Map #3-34-4 indicates a proposed discount store.

ITE code 815 (Free standing discount store)

Independent variable = Gross Floor Area (GFA)

Thus:

Total # of peak hour trips generated
= (1,000 sq. ft. of GFA) x (average rate of trips)

= 28.46 x 7.66
= 218 total trips

Examples/Commercial

Tax parcel on Sussex County Tax Parcel Map #3-34-6 indicates a proposed discount store.

ITE code 815 (Free standing discount store)

Independent variable = Gross Floor Area (GFA)

Thus:

Total # of peak hour trips generated
= (1,000 sq. ft. of GFA) x (average rate of trips)

= 215.57 x 7.66
= 1,651 total trips

Trip Distribution & Assignment

Trip Distribution & Assignment
Base Land Use Scenario (2007)

Process

(1) Identify increase in background traffic between 1998 and 2007, based on regional travel model.

(2) Identify "distribution patterns" of base case landuses (2007) based on regional model

(3) Calculate "total 2007 traffic" by adding background traffic and base case traffic together.

Tools Used for Analysis

Trip Assignment
Base Land Use Scenario (2007)

Example: Residential

Input additional trips plus expected growth in background traffic into traffic model as growth factors for impacted roadway(s)

Trip Distribution & Assignment
Base Land Use Scenario (2007)

Example: Residential

(1) Input additional trips plus expected growth in "background" traffic into traffic model as growth factors for impacted roadway(s)

(2) Run model to view the simulation and check changes in delay, speed and other measures of effectiveness (MOEs).

RD 275 / Route 24
Year 1998

RD 275 / Route 24
Year 2007

Model Output -Sample

1998

Measures of Effectiveness

Network Totals

Signal Delay / Veh (s)	46
Total Signal Delay (hr)	[illegible]
Average Speed (mph)	5
Total Travel Time (hr)	[illegible]
Distance Traveled (mi)	[illegible]
Fuel Consumed (gal)	[illegible]
Fuel Economy (mpg)	[illegible]
CO Emissions (kg)	[illegible]
NOx Emissions (kg)	[illegible]
VOC Emissions (kg)	[illegible]
Performance Index	[illegible]

2007

Measures of Effectiveness

Network Totals

Signal Delay / Veh (s)	72
Total Signal Delay (hr)	4613
Average Speed (mph)	4
Total Travel Time (hr)	[illegible]
Distance Traveled (mi)	[illegible]
Fuel Consumed (gal)	4739
Fuel Economy (mpg)	3.3
CO Emissions (kg)	[illegible]
NOx Emissions (kg)	94.30
VOC Emissions (kg)	[illegible]
Performance Index	[illegible]

Model Results
SR 1 / Rehoboth Avenue

1998

2007

Break Out Session

Assess Break Out Session

- Did we accomplish what we set out to do?
  - Do you more thoroughly understand the project?
  - Are you more comfortable with the project – the tools and where it is going?

Next Steps

- Move forward on only one land use scenario: a build-out scenario which reflects the current land use plan
- Come back at the next PAC meeting and review these results
- Postpone going to the public until after the next PAC meeting

January 23 PAC Meeting

- Review the Traffic Impacts of the Base Land Use Scenario (development in the pipeline) at 2025
- Review the Build-Out Scenario Traffic Impacts
- Discuss other Possible Scenarios
- Discuss the Upcoming Public Information Meeting (February 6)

State Route 1 Land Use/Transportation Study
Public Advisory Committee Information Meeting
Meeting Summary

December 5, 2001

Because several PAC members had expressed a desire to learn more about the study process, an information meeting was held to enable PAC members to better understand the study's technical underpinnings. This session consisted of a presentation followed by the opportunity to informally discuss issues in greater detail at "stations" staffed by study team members.

The presentation began with an overview of the project process and flow chart and a discussion of the PAC's role. It then focused on the process used to identify and analyze future year travel demand. This included the development and application of land use scenarios, trip generation, trip distribution and assignment, and the tools used to analyze the results.

The PAC then was free to visit "stations" focusing on Project Overview, Land Use, Trip Generation/Distribution/Assignment, and Tools Used for the Analysis to further discuss these areas and ask questions.

The evening ended with an assessment of this meeting by the full PAC. Most members seemed to believe it had been useful.

The next PAC meeting will be held on Wednesday, January 23, at 6:00 pm at the Officers Club in Cape Henlopen State Park.

State Route 1 Land Use & Transportation Study

Public Advisory Committee Meeting

January 23, 2002

DelDOT

Meeting Overview

- Meet the new DelDOT Project Manager
- Learn tonight about the University of Delaware's planning seminar and charrette & how it relates to this project
- Explore the results of the "Build-Out" Land Use Scenario
- Gain more knowledge about the relationship between transportation and land development patterns

DelDOT's New Project Manager

- Bobbie Geier, DelDOT Division of Planning

University of Delaware's Planning Seminar & Charrette

- Day-long public seminar on Wednesday, March 13, at Virden Center in Lewes
- Agenda:
  - Livable Delaware initiatives
  - National perspectives on linking land use and transportation
  - Presentation on community case studies
  - Charrette: Route 1 Corridor, Lewes to Rehoboth
- Use seminar as platform to help identify land use scenarios for SR1 Land Use & Transportation Study

Review of "Build-Out" Land Use Scenario and Map

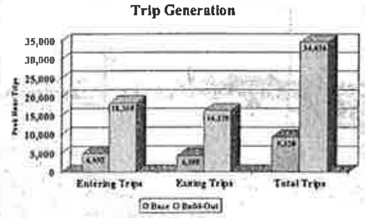
"Build-Out" Land Use Scenario & Map

- What the transportation future could be if all land in study area develops according to its zoning & the land use plan and no additional transportation improvements beyond current program are made
- Includes:
  - Currently in place development
  - New development under construction
  - Proposed development in the review process (both residential and commercial)
  - Assumed development on vacant and currently farmed land according to the zoning on the land (residential at either 2 or 4 dwelling units/acre depending on location and commercially zoned land as commercial properties)

What Are the Numbers?

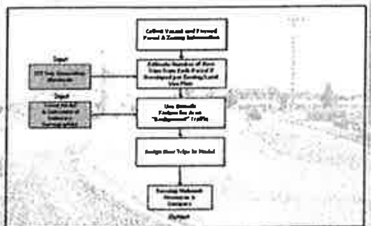
- For the "Base" Land Use Scenario (development in the "pipeline")
  - 3,129 new residential units
  - 100 acres of new commercial properties
- For the "Build-Out" Land Use Scenario
  - 21,010 new residential units
  - 203 acres of new commercial properties

2025 Base & Build Out to Plan Trip Generation



Traffic & Environmental Impacts of the "Build-Out" Land Use Scenario

Travel Methodology



SR 1 Land Use & Transportation Study

Traffic Measures

- Vehicle Miles Traveled (VMT) – total miles driven by all motorists – a key statistical measure of motor vehicle travel
- Vehicle Hours Traveled (VHT) – total number of hours spent driving by motorists
- Average speed – average motor vehicle speed
- Signal delay – amount of delay at signalized intersections

SR 1 Land Use & Transportation Study

Network Results

Network Measure	1998 Existing Condition	2007 Base Land Use	2025 Base Land Use * "Best Case"	2025 Build-Out to Plan ** "Worse Case"
VMT	40,904	52,465	65,726	91,381
VHT	2,940	5,352	9,256	27,832
Average Speed	13.91 mph	9.80 mph	7.10 mph	3.28 mph
Total Signal Delay (hrs)	2,001 hrs	4,145 hrs	7,749 hrs	25,692 hrs
Signal Delay/Veh (sec)	46 sec	74 sec	112 sec	279 sec

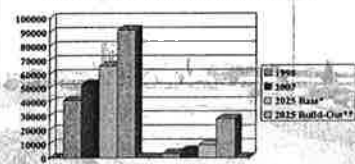
SR 1 Land Use & Transportation Study

Percentage Change

Network Measure	1998 & 2007 Base Land Use (Existing v. Interim Year)	1998 & 2025 Base Land Use (Current v. "Best Case" Future)	1998 and 2025 Build-Out (Current v. "Worse Case" Future)
Change in VMT	+ 28% (+11,561)	+ 61% (+24,822)	+ 123% (+50,477)
Change in VHT	+ 82% (+2,412)	+ 214% (+6,316)	+ 846% (+24,892)
Change in Average Speed	-42% (-4.11 MPH)	-96% (-6.81 MPH)	-324% (-10.63 MPH)
Change in Total Signal Delay	+ 107% (+2,144 hrs)	+ 287% (+5,748 hrs)	+ 1,184% (+23,691 hrs)
Change in Signal Delay/Veh	+ 60% (+28 sec)	+ 143% (+66 sec)	+ 506% (+233 sec)

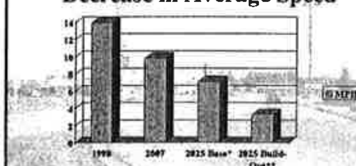
SR 1 Land Use & Transportation Study

Increase in VMT and VHT



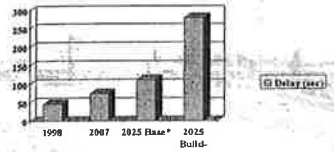
SR 1 Land Use & Transportation Study

Decrease in Average Speed



SR 1 Land Use & Transportation Study

Increase in Signal Delay/Vehicle (sec)



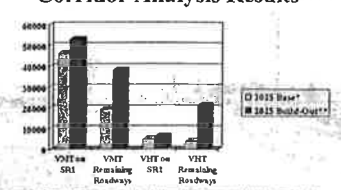
SR 1 Land Use & Transportation Study

Corridor Analysis

- Compare measures for SR1 with measures for entire study area
- SR1 corridor becomes saturated
  - In 2025 Base Land Use Scenario, SR1 carries 70% of entire study area VMT
  - In 2025 Build-Out Scenario, SR1 carries 58% of VMT
  - Indicates a shift in traffic volumes to other roadways once SR1 is saturated

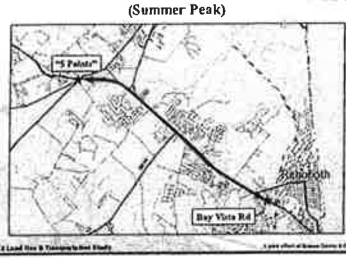
SR 1 Land Use & Transportation Study

Corridor Analysis Results

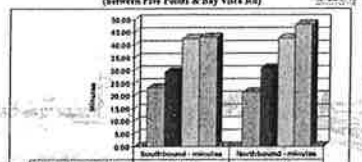


SR 1 Land Use & Transportation Study

Changes in Travel Time
(Summer Peak)



SR 1 Corridor Travel Time Analysis
(between Five Points & Bay Vista Rd)



	Southbound - minutes	Northbound - minutes
1998 Existing Condition	23.10	21.43
2007 Base Land Use Scenario	29.30	30.72
2025 Base Land Use Scenario	42.44	42.83
2025 Build-Out Land Use Scenario	42.90	48.04

Environmental Measures

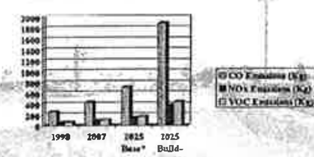
Air Quality – Measured in Kg of emissions

- CO Emissions - Carbon monoxide (CO) is a colorless gas formed by the incomplete combustion of fuel. In urban areas, vehicles can produce 90% of CO emissions.
- Ozone (O_3) is a colorless gas associated with smog or haze conditions. Ozone is not a direct emission, but a secondary pollutant formed when precursor emissions, volatile organic compounds (VOCs), also known as hydrocarbons (HC), and oxides of nitrogen (NO_x), react in the presence of sunlight.

Environmental Measures

Measure	1998 Existing Condition	2007 Base Land Use	2025 Base Land Use * "Best Case"	2025 Build-Out to Plan ** "Worse Case"
CO Emissions	254 Kg	429 Kg	705 Kg	1,886 Kg
NO_x Emissions	49 Kg	83 Kg	137 Kg	376 Kg
VOC Emissions	59 Kg	99 Kg	163 Kg	437 Kg

Environmental Measures

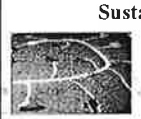


Conclusions

- Rate of VHT increase much higher than VMT – indicates excessive congestion
- Steep increase in signal delay per vehicle – indicates deteriorated traffic conditions
- Traffic measures indicate the existing network can not sustain the 2025 Base Land Use traffic
- Environmental measures indicate severe deterioration in air quality
- Overall, measures indicate highly deteriorated quality of life

More About the Connection Between Land Use and Transportation

Suburban Sprawl v. Planned, Sustainable Growth



Planned, Sustainable Growth:
- Lower per capita VMT
- Shorter travel times
- Lower emissions
- Helps with congestion
- Reduced infrastructure costs
- Helps encourage use of transit, biking and walking

3 Principles of Sustainable Development

- DIVERSITY

HARBOR POINT, BOSTON

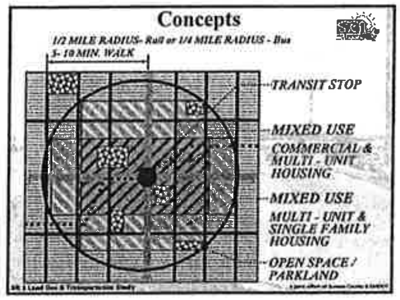
- DENSITY

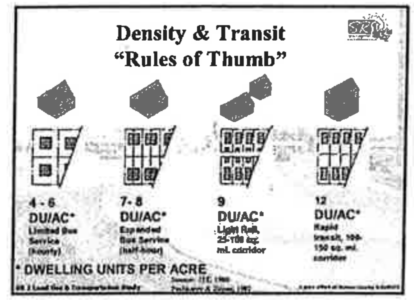
SOUTH BRENTWOOD, LOS ANGELES

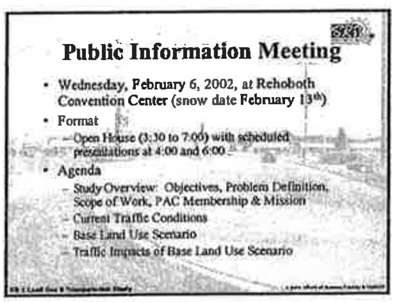
- DESIGN

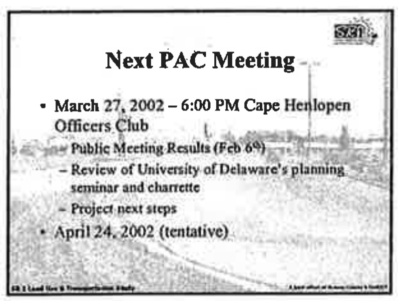
VICTORIA PARK, MANCHESTER, 1837


Measures of Pedestrian & Bicycle Friendliness
Density
Mixed Use
Continuous grid street patterns
Continuous sidewalks
Convenient building entrances
Easy street crossings
Safe traffic speeds
Gentle street slopes


Concepts
1/2 MILE RADIUS- Rail or 1/4 MILE RADIUS - Bus
5- 10 MIN. WALK
TRANSIT STOP
MIXED USE
COMMERCIAL & MULTI - UNIT HOUSING
MIXED USE
MULTI - UNIT & SINGLE FAMILY HOUSING
OPEN SPACE / PARKLAND


Density & Transit
"Rules of Thumb"
4 - 6 DU/AC*
7- 8 DU/AC*
9 DU/AC*
12 DU/AC*
* DWELLING UNITS PER ACRE


Public Information Meeting
Wednesday, February 6, 2002, at Rehoboth Convention Center (snow date February 13th)
Format
– Open House (3:30 to 7:00) with scheduled presentations at 4:00 and 6:00
Agenda
– Study Overview: Objectives, Problem Definition, Scope of Work, PAC Membership & Mission
– Current Traffic Conditions
– Base Land Use Scenario
– Traffic Impacts of Base Land Use Scenario


Next PAC Meeting
March 27, 2002 – 6:00 PM Cape Henlopen Officers Club
– Public Meeting Results (Feb 6th)
– Review of University of Delaware's planning seminar and charrette
– Project next steps
April 24, 2002 (tentative)


Additional PAC Member Comments


Public Comments

State Route 1 Land Use/Transportation Study

Public Advisory Committee
Meeting Summary
January 23, 2002

Joe Cantalupo introduced Bobbie Geier, who will serve as project manager for the rest of this study. Bobbie has extensive experience in the study area, including individual projects for Rehoboth Beach and Dewey Beach, and she recently completed the update of Sussex County's Long-Range Transportation Plan.

Other business included an announcement of a day-long seminar on the links between land use and transportation that will conclude with a workshop focusing on the SR 1 corridor between Lewes and Rehoboth/Dewey Beach. The study team anticipates the seminar will provide a strong basis for identifying land use scenarios that could be considered as part of our study. DelDOT has arranged for PAC members to attend the presentations and participate in the workshop free of charge. The seminar will be held on Wednesday, March 13, from 8 am to 5 pm at the Virden Center – University of Delaware Campus in Lewes, and will include lunch. Several PAC members are already planning to attend. If you are interested, please email Bobbie Geier at rgeier@mail.dot.state.de.us or call her at 760-2157 to let her know as soon as possible.

The presentation at this meeting centered on the traffic impacts of the Build-Out To Plan Land Use Scenario. This scenario represents the study area in the year 2025 if all land in the area were developed according to its current zoning and land use plan and no additional transportation improvements were made beyond those in the current program. Using this approach, the study area would have approximately 21,000 more residential units and another 200 acres of commercial development.

Modeling of the Base Case Land Use Scenario (no new development beyond what is planned) has already demonstrated that only three signalized intersections would continue to operate in 2007 as well as they operated in 1998. Not surprisingly, projecting these results to the year 2025 indicates that mobility in the study area under the Base Case scenario would deteriorate significantly,

and the situation will get even worse if development proceeds according to the current plan and zoning (the Build-Out To Plan Land Use Scenario).
The presentation also included a review of the kinds of land uses that promote sustainable growth, including shorter trips, less congestion, and the use of modes other than driving – transit, walking, and bicycling.

The next PAC meeting is scheduled for March 27, 2002, and will include discussion about the University of Delaware's planning seminar, the public information meeting held on February 6, and next steps for the study.

State Route 1 Land Use & Transportation Study

Public Advisory Committee Meeting #6
April 10, 2002
Rehoboth Convention Center

DelDOT

Meeting Overview

- What we heard at the most recent Public Information Meeting
- Discussion about the University of Delaware's/Greater Lewes Foundation's planning seminar and charrette & how it relates to this project
- Options for additional land use scenarios
- Next steps

What We Heard at the Public Meeting

- 128 people attended the Public Information Meeting on February 6.
- The public expressed greater awareness of the impacts of land use on the transportation system.
- The public is pleased to see Sussex County and DelDOT taking a comprehensive approach to link land use and transportation.

What We Heard at the Public Meeting

- Many are concerned about whether the resulting land use and transportation plan will be implemented.
- They are also interested in how this plan will be incorporated in other county & state planning documents.

University of Delaware's Planning Seminar & Charrette

- Day-long seminar on Wednesday, March 13, at Virden Center in Lewes
- Agenda:
  - Livable Delaware initiatives
  - National perspectives on linking land use and transportation
  - Presentation on community case studies
  - Charrette: Route 1 Corridor, Lewes to Rehoboth – "What is needed for the area to preserve its unique character and ensure good mobility and accessibility into the future?"
- Use seminar to broaden PAC member knowledge about the links between land use and transportation

What We Heard at the Charrette/Seminar

- Many groups focused on transportation solutions; only offered some land use solutions
- However, many common themes emerged across groups
- Transportation ideas:
  - Use frontage roads/service roads
  - Apply access management
  - Use Route 113
  - Improve east-west access
  - Make multimodal improvements
  - Separate through and local traffic
  - Provide interconnectivity & local roads

What We Heard at the Charrette/Seminar (cont.)

- Land use ideas:
  - Develop different visions, planning areas, and plans for the eastern and western parts of Sussex County
  - Use better designs for neighborhoods & commercial development
  - Provide incentives for development
- Other:
  - Integrate local, regional, & state planning
  - Protect environmental resources

What We Heard at the Charrette/Seminar (cont.)

- National Speakers:
  - Need to identify long-term vision for growth to support the development of land use objectives
  - Transportation systems should support land use objectives
  - Mixed-use, compact forms of development (activity centers) with gathering/focal points
  - ½ mile radius for communities and neighborhoods
  - Use of overlay districts with design and transportation standards

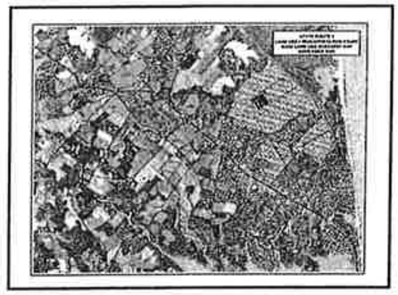
Concepts

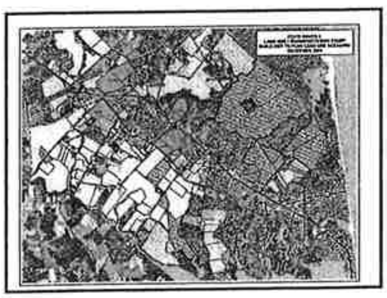
- Sustainable, planned development
- Mix land uses; focal points or gathering points
- Design is at a pedestrian scale; compact
- Walkable & bikeable neighborhoods
- Creates housing opportunities & choices
- Can help make transit feasible
- Reduces dependency on automobile
- Helps reduce infrastructure costs

PAC Member Statements on What They Heard

Options for Other Land Use Scenarios

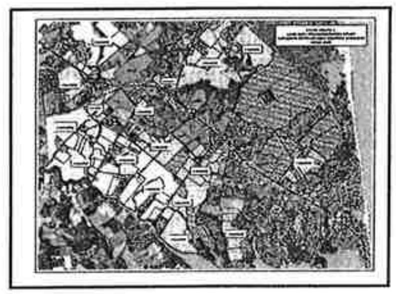
- A Review – We've Already Analyzed:
  - Base Land Use Scenario – a limited growth scenario as it assumes only development currently under construction and in the pipeline
  - Build Out to Plan Land Use Scenario – a growth scenario that depicts "build-out" of the study area under the existing zoning and land use plan





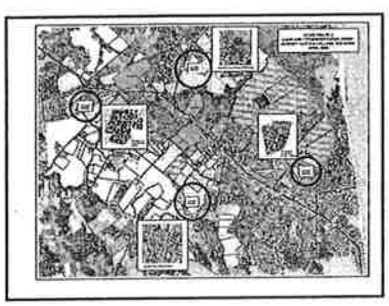
Options for Other Land Use Scenarios (cont.)

- *Expanded Development District Scenario*
  - Assume an expansion of the development district, a consideration occurring as part of the comprehensive plan update process
  - Assume commercial land develops as per zoning (same as was done in "Build-Out to Plan" scenario)



Options for Other Land Use Scenarios (cont.)

- *Multi-Use Activity Centers/Villages in Expanded Development District*
  - Assume four compact, multi-use centers or villages: one near Lewes, one near Rehoboth, one near new school site, one near Route 23 in large tracts
  - Assume mixed-use
  - Assume a downzone or transfer existing commercial zoning to activity centers or villages
  - Assume a density of 2du/acre on land outside of activity centers or villages



Next Steps

- Forecast travel demand for the additional scenarios
- Analyze transportation impacts
- Report findings to PAC
- PAC recommends a preferred land use scenario
- Develop transportation plan to match the preferred land use scenario

State Route 1 Land Use & Transportation Study
Public Advisory Committee
Meeting Summary
April 10, 2002

The meeting began with a review of public comments from the February 6th Public Information Meeting and brief remarks from some of the PAC members who attended the seminar/charrette sponsored by the University of Delaware and Greater Lewes Foundation on March 13.

For the most part, the public's comments were positive. Citizens appear to understand the connections between land use and the transportation system, and many are very happy to see that Sussex County and DelDOT are working together to find a solution to the travel problems in this corridor. Several people expressed concern about whether the resulting land use and transportation plans would be implemented, and how they would be incorporated in other county and state planning documents.

The remarks about the seminar/charrette were also positive. Those who attended agreed that Whit Blanton gave an excellent presentation and introduced a variety of interesting concepts to consider, especially in terms of the development of activity centers and the application of design standards. Most agreed that a strong, comprehensive land use plan would mitigate much of the perceived tension between the community and developers. Although it may be a little late in the process to apply all of Blanton's ideas, possibilities still exist to effect change.

The rest of the meeting centered on two additional land use scenarios to be modeled. One assumes an expansion of the Development District, and the other assumes clustered development around activity centers (or villages).

The concept of an expanded Development District is one of many issues being considered as part of the update of Sussex County's Comprehensive Plan. This fact alone makes it a good candidate for study; modeling this alternative land use scenario will assist the County in its decision-making process. Under this scenario, both commercial and residential land would be developed according to current zoning. Residential land within the expanded Development District would be developed at 4 dwelling units per acre, while residential land outside the Development District would be developed at 2 dwelling units per acre. The net result would be that more currently undeveloped residential land would be developed at 4 dwelling units per acre rather than 2.

The second new land use scenario would involve the creation of compact, multi-use activity centers/villages in an expanded Development District. These activity centers would include both residential development and retail/commercial development of the type associated with a neighborhood (for example, a bakery, a video store, a deli, a hair salon). This mix of retail/commercial and residential development would mean that people would be able to meet some of their needs within the activity center without having to travel to or on SR 1.

This scenario assumes that land outside the activity centers and outside the expanded Development District would be developed at 1 dwelling unit per acre, with the balance of residential development transferred to the different activity centers. The study team proposed four activity centers: one near the Cape Henlopen High School, one close to Rehoboth, one near the new school to be built on Rt. 24, and one on a large tract of land near Rt. 23.

Reactions to these two scenarios were mixed, but the PAC expressed a willingness to have them modeled and analyzed to identify what one member referred to as "the good, the bad, and the ugly" about them. Two people stressed the need to use extreme caution when considering the environmentally sensitive lands east of SR 1, and a PAC member also advised that we should watch for headwater areas and incorporate setbacks and buffers. Another member suggested that the activity center on Rt. 23 should have a nicely landscaped waterfront area, or at least a public park. As a result of this discussion, the study team will consider eliminating the proposed activity center near Glade Road and adding an activity center near the new Beebe Medical Center.

At the next PAC meeting we will describe the two new land use scenarios in greater detail, discuss the traffic impacts of those scenarios and the build-out to plan scenario, and attempt to reach consensus about which scenario should move forward for the development of a complimentary transportation system plan.

State Route 1 Land Use & Transportation Study

Public Advisory Committee Meeting #7

May 22, 2002

Rehoboth Convention Center

Conference Suite

DelDOT

Meeting Overview

- Meet the Facilitator for Tonight's Meeting
- Review the Land Use Scenarios
- Hear the Results of the "Expanded Development District" Land Use Scenario and the "Activity Center/Village" Land Use Scenario
- Discuss the Benefits and Drawbacks for Each Land Use Scenario
- Indicate a Preferred Land Use Scenario

Tonight's Meeting Facilitator

Bill McGowan

Review of Study Milestones

Past Study Milestones

Date	Milestone
June 2001	PAC Meeting: Project Introduction
August 2001	Public Meeting: Project Introduction
September 2001	PAC Meeting: Problem Statement, Mission Statement, Base Land Use Scenario, Possibilities for Other Land Use Scenarios
November 2001	PAC Meeting: Traffic and Land Use Trends, Results for Base Land Use Scenario & Discussion of Options for Other Land Use Scenarios
December 2001	PAC Meeting: Review of Study Process and Analysis Tools
January 2002	PAC Meeting: Results of "Build Out to Plan" Scenario
February 2002	Public Meeting: Traffic and Land Use Trends & Results for Base Land Use Scenario
March 2002	University of Delaware Planning Seminar/Charrette
April 2002	PAC Meeting: Discussion of Seminar/Charrette and Two Additional Scenarios

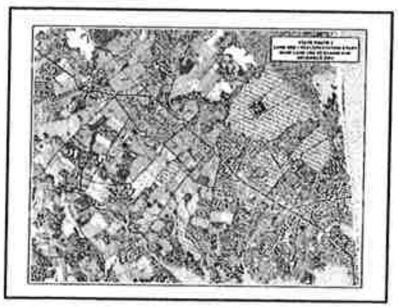
Upcoming Study Milestones

Date	Milestone
May 2002	PAC Meeting: Transportation Impact Results of the Expanded Development District Scenario and the Activity Center/Village Scenario; Recommendation of Preferred Land Use Scenario
June 2002	PAC Meeting: Environmental Screening Results & Transportation Problem Areas, Improvement Needs
August 2002	Public Meeting: Transportation Impact Results of the 3 Land Use Scenarios & Discussion of Preferred Land Use Scenario
September 2002	PAC Meeting: Draft Transportation Plan
November 2002	Public Meeting: Draft Transportation Plan PAC Meeting: Finalize Transportation Plan, Priorities
December 2002	Public Meeting: Final Transportation Plan

Review of the Land Use Scenarios

- We've Already Analyzed and Reported on:

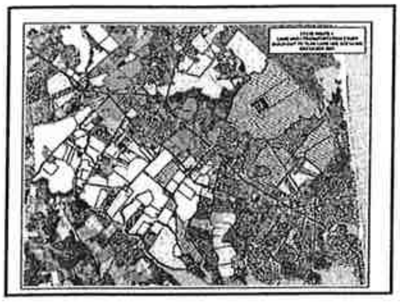
Base Land Use Scenario – a limited growth scenario that assumes only development currently under construction and in the review pipeline



Review of the Land Use Scenarios (cont.)

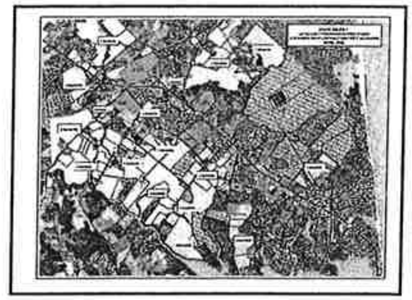
- We've Already Analyzed and Reported on:

Build Out to Plan Land Use Scenario – a growth scenario that depicts "build-out" of the study area under the existing zoning and land use plan



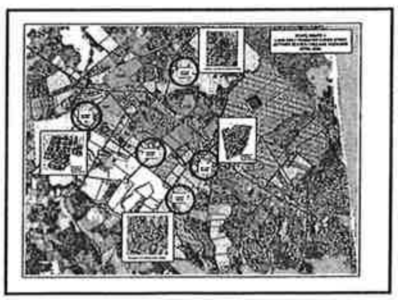
Review of the Land Use Scenarios (cont.)

- **Expanded Development District Scenario**
  - Scenario assumes changes being considered as part of the discussions on the Comprehensive Plan update process
    - An expansion of the development district to lands south of Road 275 (from SR23 to Road 274) from 2DUs to 4DUs acre
    - An expansion of environmentally sensitive land that reduces the development density on parcels located east of Road 274 and east of SR24 (from 4DUs to 2DUs an acre)
    - Commercial land develops as per zoning (same as the "Build-Out to Plan" scenario)



Review of the Land Use Scenarios (cont.)

- **Activity Centers/Villages in an Expanded Development District**
  - Assume study area develops in multi-use centers or villages: one near Lewes, one near new school site, one near site of new Beebe center, one near Route 23, one near Route 283 (Cedar Grove Road)
  - Assume neighborhood retail & a mix of housing types in a more compact form with open space
  - Assume a density of 1DU/acre on land outside activity centers or villages; transfer balance of density into centers/villages
  - Assume commercial land develops as per zoning (same as the "Build-Out to Plan" scenario)

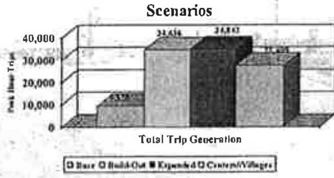


Summary of Land Use Scenarios

Scenario	Residential Units	Other Uses
Base	3,129 units	100 acres hwy commercial
Build-Out to Plan	Base Scenario plus 17,881 units	Base Scenario plus 103 acres hwy commercial
Expanded Development District	Base Scenario plus 18,103 units	Base Scenario plus 103 acres hwy commercial
Activity Centers/ Villages	Base Scenario plus 18,103 units: 12,970 in villages & 5,133 outside	Base Scenario plus 103 acres hwy commercial, 9.4 acres village retail, 107 acres internal roads, open space

Traffic & Environmental Impacts of the Land Use Scenarios

Trip Generation for Base, Build Out to Plan, Expanded & Activity Center/Village Scenarios



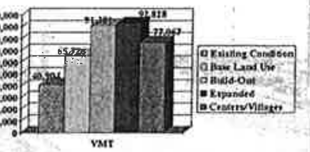
Traffic Measures

- Vehicle Miles Traveled (VMT) – total miles driven by all motorists – a key statistical measure of motor vehicle travel
- Vehicle Hours Traveled (VHT) – total number of hours spent driving by motorists
- Average speed – average motor vehicle speed
- Signal delay – amount of delay at signalized intersections

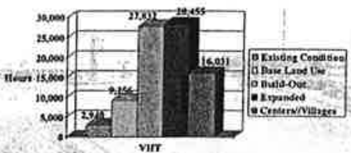
Network Results

Network Measure	Existing Condition	Base Land Use	Build-Out to Plan	Expanded Dev. District	Activity Centers/ Villages
VMT (miles)	40,904	65,726	91,381	92,928	77,067
VHT (hours)	2,948	9,256	27,832	28,455	16,031
Average Speed (mph)	13.91 mph	7.10 mph	3.28 mph	3.26 mph	4.80 mph
Signal Delay/Veh (sec)	46 sec	112 sec	279 sec	281 sec	182 sec

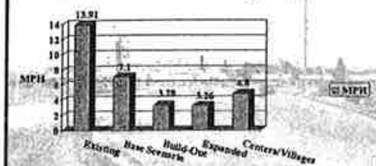
Increases in VMT



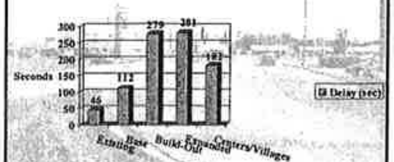
Increases in VHT



Decreases in Average Speed



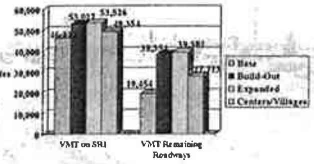
Increases in Signal Delay/Vehicle (sec)



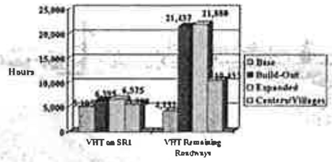
SR1 Corridor Analysis

Scenario	Share of VMT on SR1	Share of VMT on Other Roads	Explanation of Shift in Traffic Pattern
Base Land Use Scenario	70%	30%	Prominent use of the SR1 corridor by through traffic and outlet mall /resort traffic. Comparatively less local traffic originates within study area.
Build Out to & Expanded Dev. District Scenarios	58%	42%	Significant increase in local traffic due to development. Comparatively less increase in SR1 traffic. SR1 corridor is saturated.
Activity Center/Village Scenario	64%	36%	Significant reduction in local trips. Reduced necessity for local trips to approach the SR1 corridor for some day-to-day retail requirements.

SR1 Corridor Analysis Results VMT



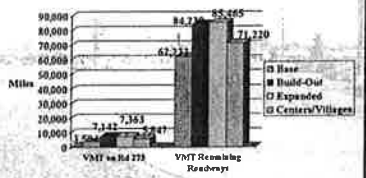
SR1 Corridor Analysis Results VHT



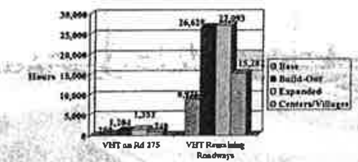
Road 275 Corridor Analyses

- Build-Out to Plan compared to Expanded Development District:
  - A small increase in corridor VMT (3%), impacts the corridor heavily as reflected by a 12% increase in VHT and 13% increase in total signal delay
- Activity Centers/Villages compared to Expanded Development District:
  - Improvement is significant (lower VMT, VHT, and signal delay and higher speeds), mainly due to increase in internal trips as a result of compact, mixed-use development

Road 275 Corridor Analysis Results - VMT



Road 275 Corridor Analysis Results - VHT

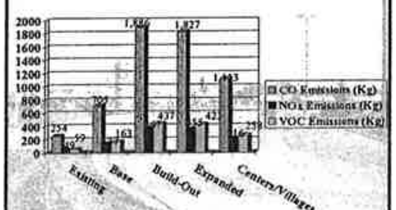


Comparative VMT Analysis

Functional Class	Land Use Scenario Base	Build-Out	Expanded	Activity Center/Village
Principal Arterials (SR1, SR18 west of SR1, Kings Hwy)	49,370	57,127	58,205	53,267
Minor Arterials (SR1A, Road 268 from SR1 to Dartmouth)	2,687	3,270	3,325	2,840
Major Collectors (SR18 east of SR1, SR23, SR24)	4,939	9,037	9,817	7,783
Local Roads (Remaining Roadways)	8,730	21,947	21,481	13,177

Activity Center scenario benefits local roadways the most and impacts major roadway corridors the least.

Environmental Measures



Conclusions

- Traffic measures indicate the existing transportation system can not sustain the Base Land Use scenario traffic.
- Traffic and environmental measures are the worst in the Build-Out to Plan and Expanded Development District scenarios:
  - Rate of VHT increase much higher than VMT—indicates excessive congestion.
  - Steep increases in signal delay per vehicle—indicates deteriorated traffic conditions.
  - Environmental measures indicate severe deterioration in air quality.
- Activity Center/Village Scenario has reduced impacts compared to Build-Out and Expanded Scenarios.

Next Steps...

- Recommend a preferred land use scenario and develop a complimentary transportation system plan.

Benefits and Drawbacks

[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

PAC Thoughts and Discussion

- What are the Benefits/Opportunities and Drawbacks/Constraints of the Different Land Use Scenarios?
  - "Build Out to Plan" Land Use Scenario
  - "Expanded Development District" Scenario
  - "Activity Center/Village" Scenario

Preference for A Land Use Scenario

- Indication of a preferred land use scenario from each PAC member:
  - What scenario,
  - Your reason, and
  - Any comments.
- Remember ground rules – make no comment on another's preference, reason or comments.
- Everyone will have a chance to speak.

State Route 1 Land Use & Transportation Study
Public Advisory Committee
Meeting Summary
May 22, 2002

The meeting began with a review of the three land use scenarios being considered – Build Out to Plan, Expanded Development District, and Activity Centers/Villages within an Expanded Development District. This was followed by a detailed presentation of the transportation impacts of each.

The rest of the meeting was dedicated to an open discussion of the advantages and disadvantages of each of the scenarios, led by Bill McGowan from the University of Delaware. The comments are summarized below by scenario.

Build Out to Plan

Advantages

- Land use would be predictable; it would be possible to devise a transportation plan to accommodate it.

Disadvantages

- Does not offer incentives for non-auto trips – would increase pollution & traffic density
- Does not identify where development would take place

Expanded Development District

Advantages

- Recognizes the current trend –urban area is expanding beyond SR 1
- Some land values would increase.
- Area east of SR 24 would be designated environmentally sensitive, with lower density, less development

Disadvantages

- Travelers would have even greater difficulty reaching SR 1.
- More traffic, more congestion
- Mid-level density would spread farther out and people now living in new Development District would move farther out, spreading sprawl.
- Development would move farther & farther away from water & wastewater infrastructure.
- Development would move too close to the waterfront (Love Creek).
- Higher land values would lead to mostly upper-middle-class residents; workers would have to move even farther from work.
- Agricultural land would be lost.
- Governor's Advisory Council won't like it.

Activity Centers/Villages in an Expanded Development District

Advantages

- Reflects the way cities traditionally developed or were planned
- Supports Livable Delaware
- Retirees like a community environment.
- Would permit real transportation planning
- Need to maintain diversity of housing mix

Disadvantages

- Trend is for stores not to move into downtown areas
- Many people like more space
- It might work for new development, but it would be difficult here – many downtown stores are vacant.
- Property values outside the centers could go down.
- Some retirees like to drive around.
- It's very difficult to get people out of their cars.
- Implementation would be very complex.
- Many property owners don't like Transfer of Development Rights because it ties up their land.
- Could lead to a loss of aquifer recharge areas.
- May be trying to do too much with 5 activity centers/villages
- Does not address traffic problems caused by travel to "destinations" like the beach

During the discussion, the PAC agreed to eliminate the Expanded Development District scenario from further consideration. In addition, the possibility of a modified alternative – Activity Centers/Villages without Expanded Development District – was raised. Individual members of the PAC were polled for their opinions; some chose not to vote, and some voted in more than one category. The results were:

Build Out to Plan

- Endorse – 2
- Mixed feelings – 4

Activity Centers/Villages without Expanded Development District

- Endorse – 9
- Endorse with reservations – 4
- Mixed feelings – 3

The PAC requested that the study team further develop the Activity Center/Village without an Expanded Development District scenario for the next meeting, and begin to identify the transportation issues associated with it.

State Route 1 Land Use & Transportation Study

Public Advisory Committee Meeting #8

Wednesday, June 12, 2002 – 4:00PM

Rehoboth Convention Center

Conference Suite

DelDOT

Meeting Overview

- Revisit the Preferred Land Use Scenario and Understand Implications
- Review the Findings from the Environmental Screening Task
- Gain an Understanding of On-Going Studies and Capital Transportation Program Activities
- Discuss Transportation Problems Areas & Possible Improvements

Revisit Preferred Land Use Scenario and Understand Implications

The PAC's Preferred Land Use Scenario

- The Activity Center Scenario within the existing development district boundary.

(No expanded development district)

- As a result, the scenario results in only two activity center locations.

(only two out of the five activity center locations are within the existing development district. As per Sussex County Comprehensive Plan guidelines, activity centers should be located within the development district)

1997 Sussex County Comprehensive Plan Guidelines For Growth Areas

Activity centers should be located within growth areas due to the following guidelines:

- Growth areas include municipality, town center district, development district, rural community district, industrial district, and commercial district.
- The goal of the County is to have future growth occur around existing Towns and in designated Development Districts, since central wastewater facilities exist or planned, which makes higher densities appropriate.
- The Development Districts will produce a mixed use growth pattern supported by public and private investments to provide a variety of economic development and housing opportunities. By encouraging higher residential densities, and commercial and industrial uses in the Development Districts, the pressure for development in the Natural Protection and Agricultural Areas will be reduced.

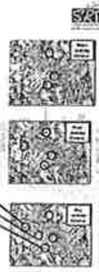
Implications of the PAC's Preferred Scenario

With Only 2 Activity Centers:

- **Less internal trips:** Implies a greater burden on the study area transportation network.
- **The benefits of the activity center concept are served in a limited way:** Implies that the majority of the new development in the study area would still require to access the SR1 Corridor.
- **Continued suburban sprawl:** Only 29 % of the new residential development within the study area would be contained in compact, mixed-use centers.

Other Options

- Increase the number of activity centers in the study area up to the previously tested five centers.
- To achieve the above considering the Sussex County Comprehensive Plan guidelines, include only the land associated with the remaining three activity centers (which are either partially or fully outside the existing development district) in a new development district OR,
- Reconsider expansion of the development district to accommodate the 5 Activity Centers (Only 222 units more than Build Out to Plan Scenario).



Distribution of Study Area Growth

Scenarios	% Growth in Activity Centers	% Growth Outside Activity Centers	Total Growth
Expanded Development District	-	-	18,103 Units
Build Out to Plan	-	-	17,881 Units
Preferred - (Existing Dev. District)	29%	71%	17,881 Units
With 3 Activity Centers	49%	51%	17,881 Units
With 4 Activity Centers	57%	43%	17,881 Units
Previously Tested - With 5 Activity Centers	72%	28%	18,103 Units

Implications of Other Options

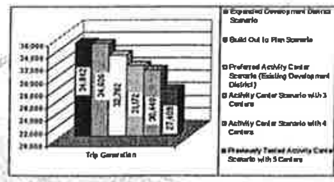
Increasing the number of activity centers implies the following:

- More & well spread-out activity centers → Less local residents would require access to SR1 for neighborhood shopping
- More activity centers → More internal trips, lesser burden on the study area transportation network
- More activity centers → Compact, mixed-use land use and less suburban sprawl; transit, biking and walking are feasible and convenient

Trip Generation for the Activity Center Options

Options	Internal Trips	Study Area Trip Generation
1. Preferred - (Existing Dev District)	1,526	32,782
2. With 3 Activity Centers	2,628	31,172
3. With 4 Activity Centers	3,004	30,440
4. Previously Tested - With 5 Activity Centers	4,130	27,409

Trip Generation for Activity Center Options



Impacts on Road 275 (Plantations Road)

- By 2025, Road 275 (Plantations Road), which is the only road parallel to SR1 within the study area, would become saturated with volume to capacity ratio (V/C) greater than one under the existing transportation infrastructure.

  The performance of the Road 275 Corridor will be as follows:

  - The signalized intersections at the either end of the corridor will operate at failing level of service (LOS - F) with the V/C ratio for the Rd. 275 approaches much higher than 1.
  - All the unsignalized intersections along Road 275 will also be operating at a failing level of service (LOS - F).
  - Roadway sections between the intersections will be operating at a level of service E, which indicates saturated traffic conditions and implies that capacity improvement would be required along the entire length of the Road 275 Corridor, not just at the intersections.

Alternatives for Capacity Improvement Along Road 275 (Plantations Road)

Alternative 1
Capacity Improvements to Plantations Road

- Provide additional capacity on Road 275

  The Road 275 Corridor is currently one lane in each direction with additional turning lanes at the intersections. It is likely that one additional lane in each direction will be necessary to move the traffic effectively in 2025.

- By-product of containing growth in the existing development district boundary

Alternative 2
New Parallel Road N/S to Provide More Capacity

- Provide additional capacity by introducing a new roadway link parallel to the Road 275 Corridor to the west of Rd. 275

  The new additional link can be provided parallel to Rd. 275 (on the west side) between US 9 and SR24. One possible alignment for this link is extension of Mulberry Road (Rd. 284) all the way up to US 9.

- By-product of expanding the development district boundary

Alternatives for Capacity Improvement Along Road 275 (Continued)

Alternative 1
Advantages

- Added capacity will provide better operating conditions as compared to the existing transportation network.

Alternative 2
Advantages

- Will reduce the traffic loads (future volumes) on Rd. 275.
- More feasible from the construction standpoint because of vacant land to the west of Rd. 275 and less impact to existing residential developments /businesses.
- Better traffic circulation option for local traffic, provides redundancy and multiple travel paths; will help to improve the performance of signalized intersections at the either ends of the Road 275 Corridor.

Alternatives for Capacity Improvement Along Road 275 (Continued)

Alternative 1
Disadvantages

- Difficult to add capacity due to the existing development.
- Additional capacity would attract additional traffic, which would adversely affect the performance of the signalized intersections and would cause greater delays at either end of the corridor.

Alternative 2
Disadvantages

- The existing development district boundary would need to be expanded westward in order to make the new alignment feasible on DelDOT's part.

Revisit Preferred Land Use Scenario and Understand Implications

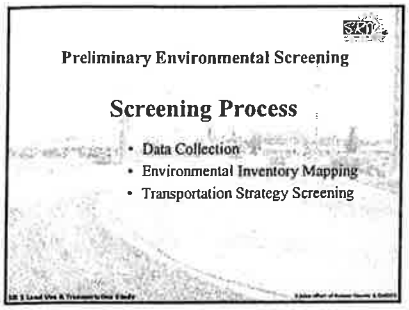
- PAC Discussion

Preliminary Environmental Screening

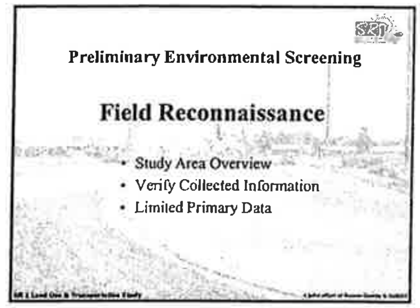
Preliminary Environmental Screening

Goals:

- Identify Existing Environmental Issues
- Develop and Shape the Transportation Plan Strategies
- Avoid or Minimize Adverse Environmental Impacts


Preliminary Environmental Screening
Screening Process
• Data Collection
• Environmental Inventory Mapping
• Transportation Strategy Screening

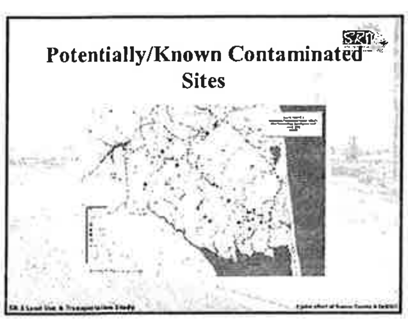

Preliminary Environmental Screening
Data Collection
Environmental Agencies Contacted:
• U.S. Environmental Protection Agency
• National Marine Fisheries Service
• U.S. Fish and Wildlife Service
• U.S. Army Corps of Engineers
• Delaware Geologic Survey
• Delaware Dept. of Agriculture
• Sussex County Preservation Planner
• Sussex County Engineer
• Sussex County Planning Office
• Sussex County Conservation District
• Lewes Historical Society
• Delaware Dept. of Natural Resources and Environmental Control
– Air and Waste Management Division
– Fish and Wildlife Division
– Information Resource Management
– Natural Heritage Program
– Parks and Recreation Division
– Soil and Water Conservation Division
– Source Water Protection Program
– State Historic Preservation Office
– Water Resources Division

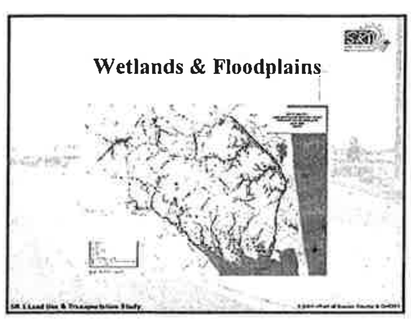

Preliminary Environmental Screening
Field Reconnaissance
• Study Area Overview
• Verify Collected Information
• Limited Primary Data

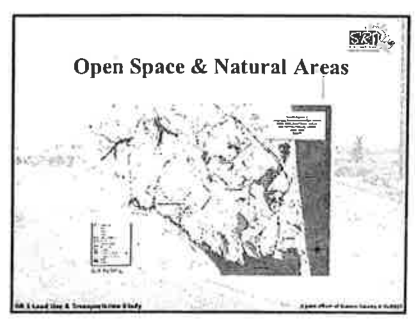

Preliminary Environmental Screening
Environmental Inventory Data
• Geology and Soils
• Groundwater
• Sussex County Recharge Areas
• Water Quality
• Watersheds
• Wetlands (SWAMP)
• Floodplains
• Endangered and Threatened Species/Habitats
• Forested Areas
• Natural Areas Inventory
• Reserved Open Space
• Natural Heritage Program Areas
• State Agricultural Districts
• State Agricultural PDR Districts
• Nature Preserves
• Conservation Easements
• State Resource Areas
• Historic Resources
• Septic System Areas
• Well-Head Protection Areas
• Known/Potential Contaminated Sites


Preliminary Environmental Screening
Environmental Inventory Mapping
• Wetlands and Floodplains
• Well-Head Protection/Ground Water Recharge Areas
• Agricultural Resources
• Historic Resources
• Parklands/Open Space
• Known/Potential Contaminated Sites
• Threatened and Endangered Species


Well-Head Protection/
Groundwater Recharge Areas


Potentially/Known Contaminated Sites


Wetlands & Floodplains


Open Space & Natural Areas

Threatened & Endangered Species

Threatened and Endangered Species

Historic Resources

Agricultural Resources

Preliminary Environmental Screening

Next Step: Transportation Strategy Screening

- Component of Overall Matrix
- Develop and Shape Transportation Strategies
- Eliminate Fatal Flaws
- Assess Permitability
- Avoid or Minimize Environmental Impacts

Review of On-Going Studies and Capital Transportation Program

Projects from the "Grid" Study

- Nassau Bike/Ped Connection – Road Design
- Third Lane Widening Project – Road Design
- Rehoboth Entrance Improvements – Study Currently Underway
- Resort Park-and-Ride Lot – Future Project

Planning Studies

- Five Point Intersection Safety Study – Ongoing
- Route 24 Planning Study – Ongoing
- SR1 Bike/Ped Study – FY'03; Based on Recommendations from the PAC

Project Development

- "New Road" Shoulder Improvements – Funded for Development FY'03
- US Route 113 North/South Improvements – Funded for Development FY'03
- Rehoboth to Lewes Bike Path - DNREC

Traffic Project

- Intersection Improvement SR1 & Bay Vista Road (shoulders, turn lanes, signals) – FY'03

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Study Area Transportation Problems and Solutions

SR 1 Land Use & Transportation Study — A joint effort of Sussex County & DelDOT

Major Transportation Problem Areas

What We Have Heard		What Traffic Analysis Shows
• Five Points Intersection	↔	1. Failing signalized intersection under existing conditions with heavy backups. By 2025, intersection delay would be more than 225 seconds. 2. By 2025, the maximum volume to capacity ratio would be more than three along the SR1 approaches.
• Congestion and Delays on SR1	↔	1. Traffic volumes under existing conditions for Saturday AM peak hour (summer) exceed capacity along the SR1 corridor between Five Points and Rehoboth Avenue. 2. By 2025, the corridor would be saturated with excessive congestion and average speed along the corridor would drop as low as 8 mph while the total corridor signal delay can go as high as 3,394 hours in 2025 compared to existing 945 hours.

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Major Transportation Problem Areas (Continued)

What We Have Heard		What Traffic Analysis Shows
• Difficult Access from Intersecting Streets onto SR1	↔	1. Under existing Saturday AM peak hour condition, through and left-turn approaches from all the side streets within the study area except two are almost failing (LOS E) or failing (LOS F). 2. By 2025, the side streets would experience even higher delays and backups directly impairing the quality of life for residents.
• Entrance to Rehoboth Beach – congestion and delays	↔	1. Failing signalized intersection under existing conditions with heavy backups. By 2025, intersection delay would be more than 275 seconds. 2. By 2025, the maximum volume to capacity ratio would be almost twice the actual intersection capacity.

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Major Transportation Problem Areas (Continued)

What We Have Heard		What Traffic Analysis Shows
• Accommodating Through Traffic	↔	1. Under existing summer Saturday AM peak hour conditions, through traffic is a major component of SR1 traffic volumes (27%) along with the resort traffic attracted by the study area, traffic attracted by outlet malls and local traffic. 2. By 2025, due to significant increase in local traffic and saturation of the SR1 corridor (with excessively high delays and backups), the corridor would discourage through traffic. Through traffic will be shifted to alternative roadways like US 113.
• Lack of Pedestrian Mobility	↔	1. The SR1 corridor lacks a continuous sidewalk system. 2. Lack of pedestrian overpasses despite the width of the corridor and commercial attractions on the either side of the corridor.

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Major Transportation Problem Areas (Continued)

What We Have Not Heard		What Traffic Analysis Shows
• Performance of SR1/SR24 intersection	↔	1. By 2025, due to significant local development along SR24 and background traffic growth along SR24 (a major regional roadway), the intersection of SR1 and SR24 would pose severe congestion problems. 2. By 2025, traffic volumes at this intersection would be more than twice the capacity of the intersection.
• Impacts on Road 275 (Plantations Road)	↔	1. As discussed earlier, Road 275 would almost become saturated due to significant new development within the study area. 2. Road 275 corridor would require additional capacity to handle 2025 traffic volumes effectively.

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Transportation Problem Areas

- PAC Thoughts on Existing Transportation Problems in the Study Area

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Solutions We've Heard

Problem: Five Points Intersection

Solutions We Heard	Some Constraints	Feasibility	Effectiveness
• Grade Separated Interchange	• Land parcels in the vicinity of the intersection have already been developed • Close to a designated historic district	Medium	High

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Solutions We've Heard (Continued)

Problem: Congestion on SR1

Solutions We Heard	Some Constraints	Feasibility	Effectiveness
• Access/service roads • High speed lanes and Service Roads • Separate local and through traffic	• Construction of access road and parallel service roads require wide right-of-way for construction and the corridor is already developed. • Intersections would still remain as the problem areas.	Low	Medium
• SR1 limited access road • Overpass at SR1 & US9 • Grade separation at US9, SR24, Rehoboth Avenue	• Majority of the corridor is developed, which makes grade separation difficult due to land availability issues.	Medium	High
• Overhead road parallel to SR1 • 4-lane elevated highway	• Less feasible from construction and cost standpoint (Low cost-to-benefit ratio). • Transitioning to other areas. • Would help to move through traffic component effectively but can not help to address local traffic problems when remainder of the study area develops.	Low	Low

SR 1 Land Use & Transportation Study — A joint effort of Sussex County & DelDOT

Solutions We've Heard (Continued)

Problem: Congestion on SR1

Solutions We Heard	Some Constraints	Feasibility	Effectiveness
• Jughandles with long egress and access at major roads	• Would improve signal phasing but difficult from construction point of view (from land availability point of view as majority of the corridor is already developed).	Medium	Medium
• Limited bypass around study area	• Geography (location of the study area), environmental issues and existing development makes suitable alignment for a bypass less feasible.	Low	High
• Use median to create another lane	• Would improve capacity on SR1 but can not help traffic congestion on side streets.	High	Medium

Additional Solutions	Some Constraints	Feasibility	Effectiveness
• Optimize signal timings • Co-ordinate signal phasing for all the signals along the SR1 corridor	• Although optimization and co-ordination of signal timings along the SR1 corridor would reduce the total signal delay by about 10%, the improvement is negligible compared to the overall delay along the corridor.	High	Medium

Solutions We've Heard (Continued)

Problem: Access to SR1

Solutions We Heard	Some Constraints	Feasibility	Effectiveness
• Longer lights for side roads to allow traffic to enter SR1	• Signal phase timings are based on the traffic volumes along the approaches at the intersection. Within the study area SR1 traffic volumes are much higher than side street volumes. Thus, longer lights for side streets would further deteriorate the performance of the SR1 corridor.	Low	Very Low

Solutions We've Heard (Continued)

Problem: Entrance to Rehoboth Beach – Congestion & Delays

Solutions We Heard	Some Constraints	Feasibility	Effectiveness
• Build 2-3 lane bridge into Rehoboth • Overpass to cross northbound traffic	• Grade separated SR1 and Rehoboth Avenue interchange would be very effective to move traffic smoothly but it has limitations from construction standpoint due to existing development near this intersection and availability of land to construct grade separated ramp systems.	Medium	High

Solutions We've Heard (Continued)

Problem: Accommodating Through Traffic

Solutions We Heard	Some Constraints	Feasibility	Effectiveness
• Use flashing signs "Use US 113"	• SR1 is more attractive route due to outlet malls and resort area, but if ITS variable message signs are placed at US113 and SR1 split warning motorists of likely congestion along SR1, it would help divert some through traffic on US113	High	Medium-High

Solutions We've Heard (Continued)

Problem: Pedestrian Mobility

Solutions We Heard	Some Constraints	Feasibility	Effectiveness
• Pedestrian overpass from Camelot to K-Mart • Overpasses at Dewey and at outlets • Overpass between Outlet Centers 2 & 3	• Requires sufficient vertical clearance due to commercial truck traffic along SR1. • Requires a lot of right of way to provide for ADA ramps.	High	High

Additional Solutions	Some Constraints	Feasibility	Effectiveness
• Continuous side walk system along SR1 within the study area	• May have some right-of way issues since the corridor is already wide	Medium - High	High

Transportation Solutions

- PAC Thoughts on additional Transportation Solutions in the Study Area

Upcoming PAC Meeting & Public Meeting

- Next PAC Meeting: **September 25 at 6:00PM**
  - Agenda:
    - Draft Transportation Plan
- Public Information Meeting: **Tentative for September 18th from 3:30 p.m. to 7:00 p.m.** at Virden Center, University of Delaware College of Marine Studies, Lewes

Additional PAC Member Comments

Public Comments

State Route 1 Land Use & Transportation Study
Public Advisory Committee
Meeting Summary
June 12, 2002

The eighth meeting of the Public Advisory Committee (PAC) focused on several items:

- Clarification of the preferred land use scenario, including trip generation, implications for Road 275, and other issues
- Preliminary environmental screening results
- Review of ongoing studies in the area and capital transportation program activities
- Transportation problems in the study area and possible solutions

Further analysis of the preferred land use scenario, Activity Centers within the existing Development District boundary, has revealed the following:

- Only two activity centers would be possible – all or part of the other three activity centers originally proposed are outside the Development District. As a result:
    - Fewer internal trips would be served.
    - Most of the new development in the study area would still require access to the SR 1 corridor.
    - Only 29% of the new residential development in the study area would be contained in compact, mixed-use centers (compared to 72% in the original scenario).
- Road 275 (Plantations Road), the only road parallel to SR 1 within the study area, would become saturated by 2025. Capacity improvements would be required along the entire length of Road 275, not just at the intersections, all of which would be operating at LOS F (failing).

After discussion of the available options (which continued throughout the evening), the PAC agreed that the best choice would be to include only the land associated with activity centers in any new Development District. The number of activity centers to be developed was left to the study team, with the provision that no activity center be located east of SR 1.

The preliminary environmental screening review encompassed the following areas:

- Wetlands and floodplains
- Well-head protection/groundwater recharge areas
- Agricultural resources
- Historic resources
- Parklands/open space
- Known/potential contaminated sites
- Threatened and endangered species

The presenters stressed that their work is at an early stage, and a number of PAC members suggested additional sources of information. The environmental work will help to develop and shape the transportation strategies, eliminate fatal flaws, assess permitability, and avoid or minimize environmental impacts.

Following a review of ongoing and planned projects within the study area, the discussion turned to comments and suggestions from the public about transportation problems and solutions (including their constraints, feasibility, and probable effectiveness). Details are included in handouts for the meeting.

Members of the PAC added the following problems/solutions:

- The traffic signals at Bay Vista and Rehoboth Avenue are not synchronized.
- Multi-use lanes for bicyclists and pedestrians would be preferable to sidewalks.
- The intersection of Postal Lane/Plantations Road/Cedar Grove Road needs to be realigned and signalized.
- The two traffic signals at LL Bean and Postal Road cause backups; the LL Bean signal should be removed.
- A right-turn signal on Postal Lane to Plantations Road would help.
- The light sequence going west from Lewes to Five Points should be revisited.
- There are broken connections among the shopping areas – infill is required.
- The curb cuts on SR 1 near McDonalds are dangerous (two right turns – one into McDonalds, very close together).
- The new left turn northbound at Home Depot should be signalized so a car would "trip" it.
- Some unsignalized left turns should be eliminated.
- Signage throughout the corridor is bad; directions to Rehoboth Beach are poor.
- Buses should be limited to 25 mph.
- Bus drivers should drive in general lanes when traffic is good and use the diamond lane only when necessary.
- Shady Road @ Plantations Road could be used as a connector.
- Pedestrian tunnels should be considered.
- Traffic signals should be synchronized.

The next PAC meeting will be held at 6:00 on Wednesday, September 25, at the Lewes Public Library. The study team will present the draft transportation plan at that time. PAC members are also encouraged to attend the Public Information Meeting to be held on Wednesday, September 18, from 3:30 to 7:00 at the Virden Center in Lewes (University of Delaware College of Marine Studies).

State Route 1 Land Use & Transportation Study

Public Advisory Committee Meeting #9

Wednesday, September 25 – 6:00PM

Lewes Public Library

DelDOT

Meeting Overview

- Learn What We Heard at the Public Meeting
- Gain an Understanding of the Major and Minor Transportation Alternatives
- Review the Preliminary Environmental Impacts of the Major Transportation Alternatives
- Discuss the Evaluation Criteria To Be Used

What We Heard at the Public Meeting

Common Themes

- Strong desire to slow development or stop it entirely
- Like concept of Activity Centers but skeptical about their beneficial effects on traffic
  - o Will they reduce enough trips to make a difference?
  - o Will businesses go there? Will businesses do well?
- Focus is on transportation elements
  - o More connections, including alternatives to SR 1
  - o Overpasses, service roads, limited bypass, etc.
- Eager to see improvements soon

Transportation Alternatives Being Analyzed

Clearing Up Any Misconceptions

The alternatives are:

- Possible improvement options which will be assessed with travel models, screened for environmental impacts & evaluated
- Concepts to improve the transportation system

This Study:

- Is the first step in the project development process
- Establishes purpose and need for any large-scale transportation improvement in the study area
- Will require further development – continued engineering/design, EA/EIS, & public involvement

The alternatives are not projects, they are concepts to be further developed.

The study is not final design, there is still much work to be done.

Alternatives Under Study

- Major alternatives represent major transportation infrastructure improvement options for the study area based on PAC and public suggestions.
- Minor, short-term transportation improvements, such as individual intersection improvements, intersection realignments, signal coordination improvements, would be coupled with each of the major alternatives to analyze the overall impact on the SR 1 study area.

ALTERNATIVE 1

➢ Add Capacity to Road 275 and SR 24

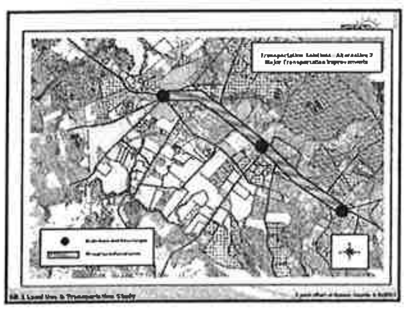
- Two sub-alternatives:
  - 1A → Grade-separated interchange at Five Points
  - 1B → No grade separation
- Grade-separated Interchange at Five Points:
  - → Helps to reduce excessive delays at this intersection
  - → Provides better connections to intersecting roads from SR 1
  - → Improves safety (this intersection is currently included in Highway Safety Improvement Program due to high accident location)

ALTERNATIVE 1 (Continued)

- Additional capacity along Rd. 275:
  - ✓Required to move increased local traffic effectively
  - ✓Improved corridor parallel to SR 1 would provide flexibility for local residents
- Additional Capacity along SR 24:
  - ✓Required to move increased local traffic volumes effectively in the corridor

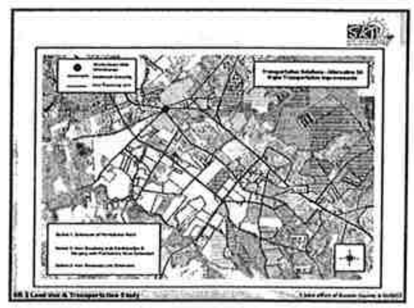
ALTERNATIVE 2

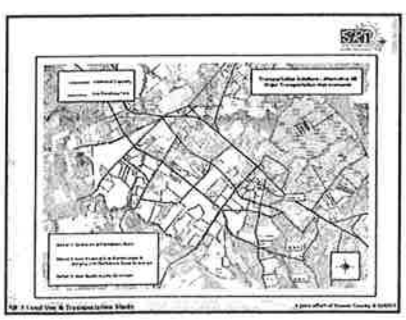
- **Commercial arterial concept for SR 1 with through and local lanes**
  - Separate local and through traffic (through traffic would include Rehoboth Beach/Dewey resort traffic)
    - Provides improved accessibility for residents & visitors
  - Eliminate traffic signals along through lanes
    - Traffic signals located only along one-way local lanes
  - Provide slip ramps between through and local lanes
  - Three grade-separated diamond interchanges at Five Points, SR 24 and Rehoboth Avenue would move traffic through these intersections effectively with minimal delays



ALTERNATIVE 3

- **New alignment serving as a limited bypass to SR 1 within the study area**
  - Provide accessibility options for local residents
  - Reduce traffic volumes along the SR 1 corridor significantly
  - Serve as a connecting roadway between activity centers
- Two sub-alternatives:
  - → 3A: Interchange at Five Points
  - → 3B: No interchange





Minor Improvement Projects

- Include individual intersection improvements, intersection realignments, signal coordination improvements, smaller safety improvement projects etc

Minor Improvements	Examples
Intersection Improvement	1) SR 24 & Rd. 275 2) Rd. 274 & Rd. 275
Intersection Realignment	Rd. 275/Postal Lane/ Cedar Grove Rd.

Minor Improvement Projects (Continued)

Minor Improvements	Examples
Signal Coordination	SR 1 corridor between Five Points & Bay Vista
Safety Improvement	1) Eliminate some unsignalized left turns from SR 1 2) Add traffic light at intersection of Rd. 275 & Postal Lane

Other Transportation Improvements

- Bicycle/Pedestrian Improvements:
  - → Multi-use paths on both sides of SR 1 between Five Points and Rehoboth Avenue
  - → Pedestrian overpasses on SR 1 (necessary for Alternative 2) to connect commercial development on both sides of SR 1 corridor in a pedestrian-friendly manner
  - → Designated bicycle lanes along proposed new bypass alignment in Alternative 3, which could be a part of SR 1 Bike Route
- Transit Improvements:
  - → New bus route serving activity centers
  - → Regulate the Resort Bus Service
    1) Strictly enforce 25 MPH speed limit
    2) Provide guidelines to bus drivers to use SR 1 traffic lanes when LOS is good rather then using diamond lanes all the time
  - → Implement price study recommendations - SR 1 service & midday shopper shuttle

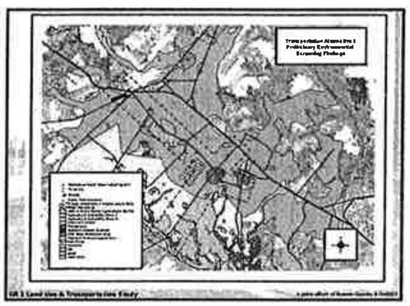
Comments on Transportation Improvement Alternatives

Preliminary Environmental Screening Findings

Preliminary Environmental Screening Findings

ALTERNATIVE 1

- Adjacent Hazardous Waste Sites
- Adjacent Church and Cemeteries
- Public Water Wells adjacent to Rd 275/ SR24
- Well Head Protection Area at Rte 24/275 intersection
- Nearby State Agricultural District (John and Helen Morris)
- Adjacent Agricultural Preservation Suitability Classes I and II
- Adjacent Wetlands associated with Dorman Branch and Love Creek
- Floodplains associated with Dorman Branch and Love Creek
- Nearby Belltown Historic District (Eligible)
- Potential Archaeological Areas
- Impact Excellent, Good, and Fair Recharge Areas
- Many adjacent Cultural Resource Inventory sites



Preliminary Environmental Screening Findings

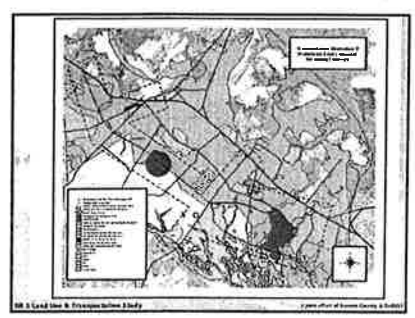
ALTERNATIVE 2

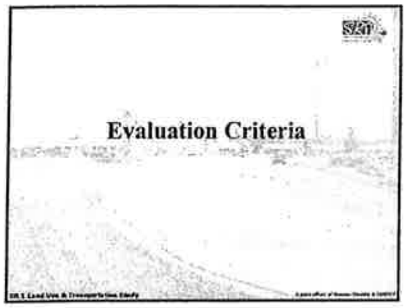
- Nearby Hazardous Waste Sites
  - → Nearby Large On-Site Septic System (Burger King, Rehoboth Market Place, Ocean Outlets Mall – Seaside, Ocean Outlets Mall – Bayside, and Ames)
  - → Nearby Hazardous Waste Generators (K-Mart and Indian River Inlet Marina)
- Nearby Churches and Cemeteries
- Public Water Wells adjacent to SR1
- Well Head Protection Area adjacent to SR1
- Nearby Washington Heights Historic District and Belltown Historic District (Eligible)
- Many adjacent Cultural Resource Inventory sites
- Adjacent wetlands associated with Ebenezer Branch, Munchy Branch, and Beaverdam Branch
- Impact Excellent and Good Recharge Areas

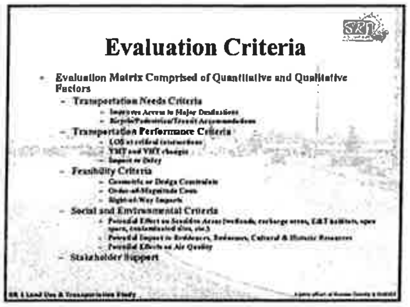
Preliminary Environmental Screening Findings

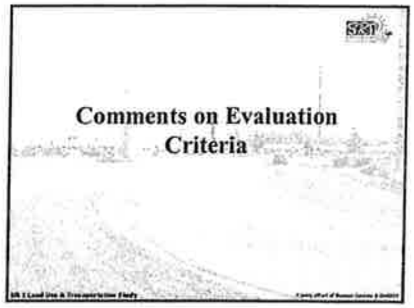
ALTERNATIVE 3

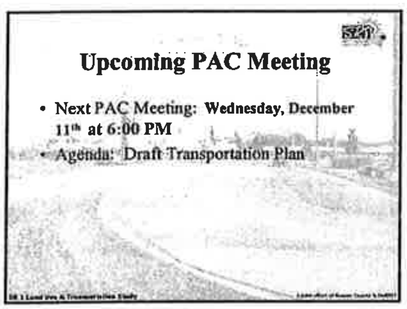
- Nearby UST sites, hazardous waste generators (US Cape Henlopen Reserve Center), Large On-Site Septic Systems and Animal Operations
- Nearby Public Water Wells
- Nearby Well Head Protection Area
- Crossing of Endangered & Threatened Species' Habitat
- Nearby golf course
- Adjacent State Agricultural District (John and Helen Morris)
- Crossing of Goslee Creek, Johnson Branch, Arnell Creek, and White Oak Creek
- Adjacent wetlands and floodplains associated with Goslee Creek, Johnson Branch, Arnell Creek, and White Oak Creek
- Adjacent Agricultural Preservation Suitability Classes I and II
- Nearby Belltown Historic District (Eligible)
- Potential Archaeological Areas
- Impact Excellent, Good, and Fair Recharge Areas
- Many adjacent Cultural Resource Inventory sites

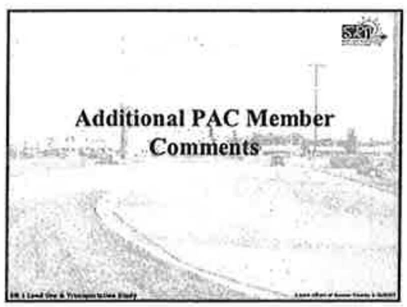



Evaluation Criteria


Evaluation Criteria
Evaluation Matrix Comprised of Quantitative and Qualitative Factors
Transportation Needs Criteria
Transportation Performance Criteria
Feasibility Criteria
Social and Environmental Criteria
Stakeholder Support


Comments on Evaluation Criteria


Upcoming PAC Meeting
Next PAC Meeting: Wednesday, December 11th at 6:00 PM
Agenda: Draft Transportation Plan


Additional PAC Member Comments


Public Comments

Land Use & Transportation Study
A joint effort of Sussex County and DelDOT

State Route 1 Land Use & Transportation Study
Public Advisory Committee
Meeting Summary

September 25/26, 2002

The ninth PAC meeting was conducted in two parts because several members of the Citizens Coalition were unable to attend the Wednesday evening session. The study team reviewed the same material with these people (and several members of the general public) on Thursday morning, also at the Lewes Library.

The meetings focused on reviewing possible transportation alternatives at the conceptual level. The study team emphasized that the effectiveness of these concepts in addressing future traffic in the study area is not yet known. The next step in the process will be to determine how much each of these alternatives helps to improve travel. It is possible that a different combination of the elements presented could ultimately be recommended. These alternatives are briefly presented below.

Alternative I would add capacity on Road 275 (Plantations Road) and SR 24, with or without a grade-separated interchange at Five Points. A grade-separated interchange could be expected to reduce excessive delays at that intersection, provide better connections to intersecting roads from SR 1, and improve safety. More capacity on Road 275 could help to move increased local traffic more effectively and give local residents more flexibility by providing an improved corridor parallel to SR 1. Additional capacity on SR 24 could help to move increased local traffic volumes in the corridor.

Alternative 2 is a commercial arterial concept for SR 1 that would separate through and local traffic. Traffic signals would be eliminated on the through lanes, and slip ramps would enable cars to move from local lanes to through lanes and vice versa. Grade-separated diamond interchanges on SR 1 at Five Points, SR 24, and Rehoboth Avenue would reduce delays at these intersections. This alternative would be expected to improve accessibility for both residents and visitors.

Alternative 3 is a new alignment serving as a limited bypass to SR 1, with or without a grade-separated interchange at Five Points. This could increase accessibility for local residents, significantly reduce traffic volumes along SR 1, and serve as a connecting roadway between activity centers. This new bypass would link with SR 1 north of the study area.

The study team also presented a number of possible minor roadway improvements, including intersection improvements, intersection realignments, signal coordination, and safety improvements. Transit, bicycle, and pedestrian improvements were also identified.

Members of the PAC made the following observations:

- Phil Voshell stated that three overpasses would not be enough to solve the problem on SR 1; five to eight would be needed. He added that the recommended plan should cover the area from north of Five Points to Dewey Beach. Phil shared a plan he developed a few years ago with the study team. He was assured that the study area has been extended to Dewey Beach.
- Pete Schwartzkopf commented that Troop #7 has seen a three-fold increase in bicycle accidents this summer.
- Erie Buehl noted that an overpass at Five Points has already been identified as a high safety priority, and that every scenario should include it. The study team responded that it will evaluate all scenarios as a sensitivity analysis to help determine the effect of each individual change.
- Phil Voshell said that every road to the study area has been improved, making getting here easier. He believes that unless the alternative addresses SR 1 directly, gridlock will remain.
- Pete Schwartzkopf stated that the real problem is at the intersection of SR 1 and 1A. He would like to see the light at 1/1A eliminated.
- Phil recommended that the study team not spend its time modeling Alternative 3, but he was told that this kind of modeling is necessary to further clarify the statement of purpose and need for the alternative eventually selected.
- Sam Cooper requested that the study area modeled be extended to Second Avenue in Rehoboth Beach.

In response to questions about the transportation modeling process, the study team explained that the future scenario will include the diversion of traffic to Route 113, improved signage, etc. The modeling process will be incremental. For example, it will start by adding one lane to Plantations Road. If that is not sufficient, it will then increase capacity as necessary until the model shows acceptable traffic flow. Although the model addresses vehicle trips, these trips can be converted to passenger trips and indirectly to bicycle/pedestrian/transit trips. Due to PAC member questions, the next PAC meeting will begin with an overview of how the modeling process works.

Comments from members of the public follow:

- Increasing capacity on Plantations Road would negatively affect the quality of life of those who live there.
- Traffic calming is needed on Plantations Road.
- Better transit for the elderly is necessary.
- We have problems only when the tourists are here.

- Alternative 1 would just move congestion from SR 1 to Plantations Road. It doesn't make sense since Road 275 is only two miles long and is not a through road.
- Sussex County should not still be permitting people to build on the edge of the highway.
- Too many houses are being built on Road 273. Better zoning is needed.
- There should be continuous shuttles among the outlets the whole time they are open. This could even reduce the need for one or more pedestrian overpasses.

State Route 1 Land Use & Transportation Study

Public Advisory Committee Meeting #10
Wednesday, December 11 – 4:00PM
Rehoboth Convention Center

DelDOT

Meeting Overview

- Revisit the Travel Demand Modeling Process
- Review the Transportation Alternatives Evaluated
- Take a Dinner Break
- Hear the Results of the Travel Demand Analyses Conducted for the Transportation Alternatives
- Discuss the Results

Travel Demand Modeling

Travel Demand Modeling

Why are Models Important?

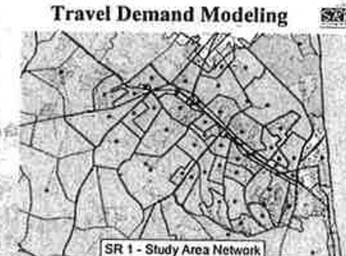
- They tell us about future travel patterns
- They shape transportation plans and investments
- They are part of the environmental review and conformity processes
- They are a valuable planning tool
- They help us make better decisions

Travel Demand Modeling

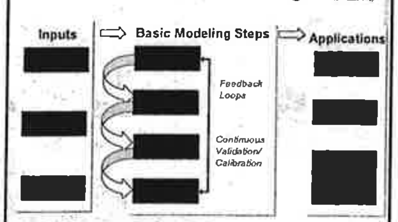
A series of mathematical equations that are used to represent how choices are made when people travel

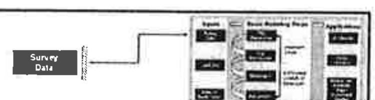
- How, when and where?
- Travel behavior characteristics
- Transportation system characteristics

Travel Demand Modeling



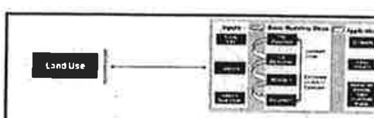
Travel Demand Modeling





Survey Data

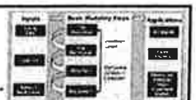
- Delaware Household Travel Survey - U of D
- Detailed Travel Information
- Trip Purposes Defined
- Trip Production/Attraction Zones Defined
- Trip Rates = trips/households



Traffic Analysis Zones (TAZs)

- A geographical unit for distributing population and land uses within a study area
- Places where trips begin or end characterized by population, number of households, employment, land use, etc.
- Centroid – represents the center of zonal activity and trip making

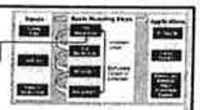
Network Development



Network

- A mathematical representation of an area's transportation facilities, composed of links and nodes
- A link is a representation of a roadway segment
- A node is a point where two links join in a network

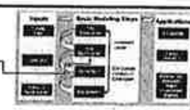
Trip Generation



Trip Generation

- The process of determining the number of trip productions and attractions associated with a given set of land use activities in a zone
- Descriptions of current land use (households/jobs)
- Projections of future land use (households/jobs)
- Applies trip rates to land use inventory

Trip Distribution

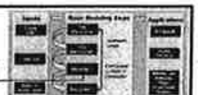


Trip Distribution

The process of determining trip exchanges or the number of trips between each pair of zones

- Productions and attractions from trip generation are input
- Trip tables are output (O-D matrices)
- Each cell contains the # of trips between zones
- Most common technique is gravity model
- Factors: accessibility(time) and activity

Mode Split

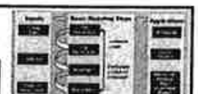


Mode Split

The process by which an individual selects a transportation mode for use on a trip

- Factors
  - Trip purpose
  - Trip location
  - Characteristics of the individual
  - Characteristics of available modes
  - Characteristics of study area

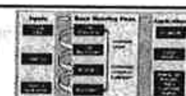
Assignment



Assignment

The process by which trips are allocated to feasible routes through a network

- Results are vehicle flows for a given time period and year
- Vehicle trip options
- Various techniques
- Most commonly used method: equilibrium



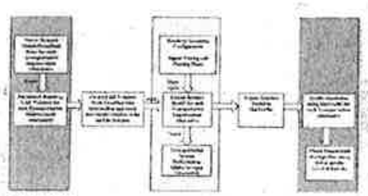
Model Output

- What routes will be used for travel?
- Minimum paths
- Congested roads
- Speeds
- Link Volumes
- Volume/Capacity Ratios

Traffic Models Used for the SR 1 Study

- **TranPlan** – Statewide travel demand and forecasting model (model has been modified to include all major roadways within the SR 1 study area)
- **Synchro** – Computer model created for the SR1 study area to analyze study area transportation system performance
- **SimTraffic** – Simulation model created to visualize future traffic patterns and their impacts on the study area transportation system

SR 1 Modeling Process



Review of the Conceptual Transportation Alternatives Analyzed

Alternative Concepts Under Study

- **Major alternatives are major transportation infrastructure improvement options or concepts** for the study area based on PAC and public suggestions.
- **Minor, short-term transportation improvements,** such as individual intersection improvements, intersection realignments, signal optimization & coordination, **were coupled with each of the major alternatives** to analyze the overall impact on the SR 1 study area.

ALTERNATIVE 1

➢ **Add Capacity to Road 275 and SR 24**

- **Two sub-alternatives:**
  - 1A → Grade-separated diamond interchange at Five Points
  - 1B → No grade separation
- **Grade-separated interchange at Five Points:**
  - → Helps to reduce excessive delays at this intersection
  - → Provides better connections to intersecting roads from SR 1
  - → Improves safety (this intersection is currently included in Highway Safety Improvement Program due to high accident location)

ALTERNATIVE 1 (Continued)

- **Additional capacity along Rd. 275:**
  - ✓Help to move increased local traffic effectively
  - ✓Provide an improved corridor parallel to SR 1 as alternate
- **Additional Capacity along SR 24:**
  - ✓Help to move increased local traffic volumes effectively in the corridor

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Alternative 1A

Alternative 1B

Diamond Interchange

ALTERNATIVE 2

➢ **Commercial arterial concept for SR 1 with through and local lanes**

- Separate local and through traffic (through traffic would include Rehoboth Beach/Dewey resort traffic)
  - Provides improved accessibility for residents & visitors
- Eliminate traffic signals along through lanes
  - Traffic signals located only along one-way local lanes
- Provide slip ramps between through and local lanes
- Three grade-separated diamond interchanges at Five Points, SR 24 and Rehoboth Avenue

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Alternative 2

ALTERNATIVE 3

➢New alignment serving as a **limited** bypass to SR 1 within the study area

- Provide accessibility options for local residents
- Reduce traffic volumes along the SR 1 corridor significantly
- Serve as a connecting roadway between activity centers

- Two sub-alternatives:
  - → 3A: Interchange at Five Points
  - → 3B: No interchange

Alternative 3A

Alternative 3B

Minor Improvements

- Include individual intersection improvements, intersection realignments, signal coordination, smaller safety improvements, etc.

Minor Improvements	Examples
Intersection Improvement	•SR 24 & Rd. 275 •Rd. 274 & Rd. 275
Intersection Realignment	Rd. 275/Postal Lane/ Cedar Grove Rd.

Minor Improvements (Continued)

Minor Improvements	Examples
Signal Optimization & Coordination	•Entire network •SR1 corridor between Five Points & Bay Vista Road
Safety Improvement	• Add traffic signal at intersection of Rd. 275 & Postal Lane • Add signal at intersection of Rd 275 and Rd 274

Dinner Break

Results of the Travel Demand Analyses of Transportation Alternatives

Travel Demand Analyses Conducted

- Measures of Effectiveness (MOEs) used to compare travel demand modeling results for the alternative concepts
- Similar to previous comparisons conducted for the various land use scenarios
- MOEs like VMT, VHT, average speed, signal delay were examined at two levels:
  - Study Area Analysis – What is the benefit of the alternative concept to the entire network in the study area?
  - SR 1 Analysis – What is the benefit of the alternative concept to SR 1 performance?

Alternative 1: Add capacity to Road 275 & SR 24 with/without diamond interchange at Five Points

General Findings

- Does not improve the overall performance of the network significantly
- Alternative 1A (with diamond interchange) is better than Alternative 1B
- Alternatives 1A and 1B show localized improvements only, neither significantly benefit overall network performance or SR 1 performance
- Addition of only one lane southbound on Road 275 is optimum for network performance
- Improvements along Road 275 do not have much impact on the performance of SR 1
- Due to localized nature of improvements this alternative could be combined with other possible alternatives to achieve better performance

Alternative 2: Commercial arterial concept with separate through & local lanes with grade-separated diamond interchanges at Five Points, SR 24, and Rehoboth Ave

General Findings

- Alternative 2 provides negligible performance improvement in network-wide MOEs, with some measures deteriorating
- Network VMT increases
- Network VHT increases

Alternative 2 General Findings (cont.)

- Significant traffic would result in the local lanes and lane volumes would exceed capacity
- Would result in delays and long lines; would require two local lanes and two express lanes in each direction
- Capacity issues still remain at the diamond interchanges -- this alternative would work effectively only if sufficient capacity is provided (6-7 lanes on overpass, 3-4 lanes on ramps, 2 lanes on slip ramps with long acceleration & deceleration lanes)

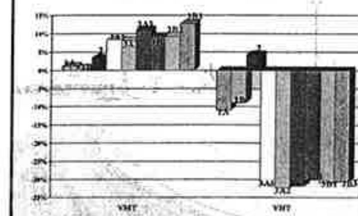
Alternative 3: By-pass roadway concept

General Findings

- **Alternative 3A (with grade-separated diamond interchange at Five Points) provides the most significant benefit to future network-wide travel conditions compared to the other alternatives analyzed**
- **Alternative 3B (without a grade-separated interchange) provides greatest benefit to SR 1 performance compared to the other alternatives analyzed**
- All three options for this new roadway alternative, south of SR 24, provide similar results
- Although VMT increases, VHT decreases
- More traffic would shift to by-pass

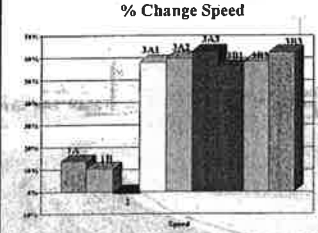
MOEs for Alternatives

% Change VMT & VHT



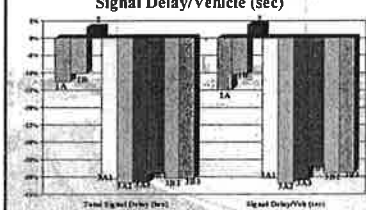
MOEs for Alternatives

% Change Speed



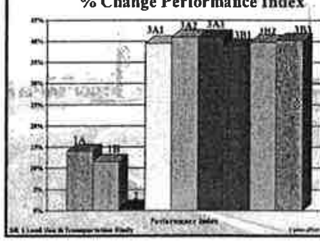
MOEs for Alternatives

% Change Total Signal Delay (hrs) & Signal Delay/Vehicle (sec)



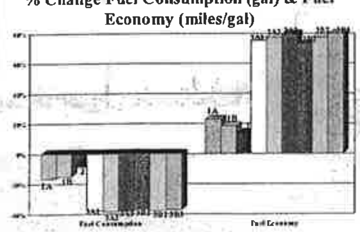
MOEs for Alternatives

% Change Performance Index



MOEs for Alternatives

% Change Fuel Consumption (gal) & Fuel Economy (miles/gal)



Discussion of Transportation Improvement Alternatives

Additional PAC Member Comments

State Route 1 Land Use & Transportation Study
Public Advisory Committee #10
Meeting Summary

December 11, 2002

The tenth meeting of the Public Advisory Committee (PAC) included a review of the transportation modeling process used by the study team and a discussion of the results from modeling the major transportation alternatives presented at the 9th meeting of the PAC.

As a quick review, the following alternatives were modeled:

- Alternative 1 – Add capacity to Road 275 (Plantations Road) and SR 24, with or without a grade-separated diamond interchange at Five Points
- Alternative 2 – Apply a commercial arterial concept to SR 1 by separating through and local lanes, with grade-separated diamond interchanges at Five Points, SR 24, and Rehoboth Avenue
- Alternative 3 – Create a limited bypass to SR 1 on a new alignment, with or without a grade-separated diamond interchange at Five Points.

Each of these alternatives would be coupled with a number of shorter-term minor improvements:

- Intersection improvements
  - SR 24 & Road 275
  - Road 274 & Road 275
- Intersection realignment
  - Road 275/Postal Lane/Cedar Grove Road
- Signal optimization & coordination
  - Entire network
  - SR 1 between Five Points and Collins Avenue
- Safety improvements
  - Add traffic signal at Road 275 & Postal Lane
  - Add traffic signal at Road 275 & Road 274

Alternative 1 – Add Capacity to Road 275 and SR 24

This alternative was developed as a possible way to help move increased local traffic effectively through the corridor by providing an improved parallel route on an existing roadway to SR 1 as an option. The grade-separated diamond interchange at Five Points would reduce long delays at this intersection, provide better connections to intersecting roads from SR 1, and improve safety.

However, the modeling process reveals that Alternative 1 would not improve the overall performance of the transportation network significantly, and that it would yield only localized improvements. Perhaps of greatest significance to residents of the study area, improvements along Road 275 would not have much effect on the performance of SR 1. Including the grade-separated interchange produced better results than leaving the intersection as is.

Alternative 2 – Apply Commercial Arterial Concept to SR 1
Under this alternative, through lanes would separate traffic headed to Rehoboth/Dewey Beach and points farther south from local traffic destined for shopping or other activities on SR 1. Slip ramps would permit traffic to move between the local and through lanes, and traffic would need to use grade-separated diamond interchanges at three key locations (Five Points, SR 24, and Rehoboth Avenue) to change direction.

However, the transportation modeling process indicates that this alternative would not improve performance of the transportation network; in fact, network vehicle miles traveled would increase, as would the average amount of time drivers would spend in traffic (vehicle hours traveled). The amount of traffic projected to use the local lanes would be more than the roadway could accommodate within existing right-of-way; to work, this alternative would require two local lanes and two express lanes in each direction. Significant delay would exist at the diamond interchanges in this alternative.

Alternative 3 – Create a Limited Bypass for SR 1 on a New Alignment
This concept was developed to improve accessibility for local residents, reduce traffic along SR 1, and serve as a connection among activity centers. Without a doubt, it would provide the most significant benefit to future network-wide travel, according to the modeling analysis. It would also provide the greatest benefit for SR 1. Although vehicle miles traveled would increase somewhat, one of the most important indicators of quality of life as it applies to transportation – vehicle hours traveled – would decrease as local traffic shifts to the bypass. The various measures of effectiveness show an improvement in such areas as VHT, average speed, signal delay, and fuel consumption and economy of 30%-40%.

Reactions to this information included the following:

- Alternative 3 could work if DelDOT adheres to the concept of a limited bypass by restricting access; the new road should enhance mobility, not real estate development.
- Sussex County should pass legislation to prevent the land near the bypass from being up-zoned for commercial development.
- One person suggested we should adopt Alternative 3 and provide grade separations for SR 24 and US 9 as well. However, the modeling shows these

intersections would have an acceptable level of service without grade separations under Alternative 3.

Bob Stickels, Sussex County administrator, presented an alternative version of Alternative 3 that would move the new limited bypass farther away from SR 1. Further discussion suggested that the new roadway should be near the congestion and SR 1 in order to relieve it.

In addition to Alternative 3 and the minor improvements mentioned above, members of the PAC indicated they would like to see the following as part of the improvements that would occur under Alternative 3:

- Bike lanes
- Sidewalks
- Provisions for public transit, including future consideration of the existing rail right-of-way for a commuter line (near Five Points area)
- A state law, supported by a county ordinance, that would ensure the new roadway remains a limited bypass
- Upgrading of any tar and chip roads
- A grade-separated interchange at Five Points
- Interconnectivity, especially among the outlets
- Proper signage to the park-and-ride near Country Club Road
- Creation of a new park-and-ride lot.

The next PAC meeting will be devoted to reviewing the elements of the draft transportation plan being prepared for this study.

State Route 1 Land Use & Transportation Study

Public Advisory Committee Meeting #11
Wednesday, February 12, 2003, 6:00 PM
Rehoboth Convention Center

DelDOT

Meeting Overview

- Review Draft Transportation Plan Elements
- Learn About Next Steps in the Project Development Process
- Discuss the Upcoming Public Information Meeting

Draft Transportation Plan Elements

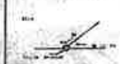
Plan Elements

- Short-Term/Immediate:
  - actions that require only signal coordination and phasing changes and, for some intersections or roadways, the development of preliminary and final engineering plans
  - policy initiatives
- Mid-Term: actions that require further project development and possibly right-of-way acquisition but can be constructed within a 3-year time frame
- Long-Term: complex actions that require additional project development and right-of-way acquisition and will take 3 or more years to go to construction, due to detailed environmental studies required to secure federal funding

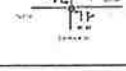
Short-Term Improvements

- Revise the plan for signal coordination, optimization, and phasing on SR 1 --- **currently underway -- expected to result in 10% improvement in corridor performance**
- Intersection Improvements
  - Change signal phasing
  - Increase storage lane lengths
  - Signalize intersections

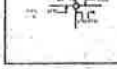
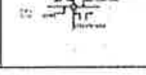
Signal Phasing – Rehoboth Avenue (SR 1A)

Existing	Proposed Concept
•3-phase signal 	•To reduce delay, intersection turning movements can be effectively handled with a 2-phase signal. 

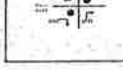
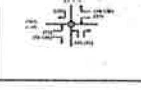
Signal Phasing – Dartmouth Drive/Kings Highway

Existing	Proposed Concept
•Different phase sequencing for through movements 	•With phase sequencing changes and signal cycle split optimization, performance can be improved. 

Storage Lengths – Plantations Road & SR 24

Existing	Proposed Concept
•Limited storage lengths 	•To reduce delay, storage lane lengths should be increased and signal splits changed. 

Signalize Intersection – Plantations Road and Rd 274

Existing	Proposed Concept
•Stop-controlled intersection 	•To improve performance and safety, signalize intersection & increase storage lengths. 

Other Short-Term Improvements

- **Realign Wescoats Corner Road with Rd 269A as a 4-way intersection as result of a dedication of right-of-way**
- **Upgrade Pavement:**
  - Roads 283 (Cedar Grove Rd) and 277 (Robbinsville Rd) will be upgraded (11' travel lanes and 5' shoulders) as per recommendations from SR 24 study

Other Short-Term Improvements

- **Transit Service:**
  - Recommend a park-and-ride usage & planning study to determine the need for additional facilities, locations, and impact on study area transportation system
  - Recommend a detailed study of transit needs
  - Recommend better coordination & training of bus drivers on use of diamond lanes

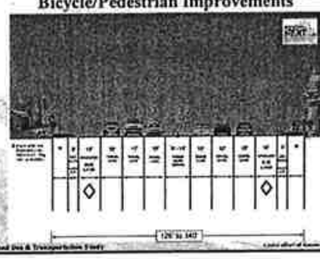
Other Short-Term Improvements

- **Signage:**
  - US 113/SR 1 split – one advance advisory sign in place, another needed for redundancy on approach to split
  - Use real-time electronic sign at US 113/SR 1 split to provide travel delay information
  - Improve signage for 1B into Rehoboth Beach
  - Improve signage for park-and-ride near Country Club Road

Improvement Concepts Mid-Term

- **Bicycle & Pedestrian Improvements along SR 1**
- **Realignment of Postal Lane/Cedar Grove and Plantations Road intersection**

SR 1 Cross Section Showing Bicycle/Pedestrian Improvements



Cedar Grove Realignment & Signalization

Existing	Proposed Concept
Postal Lane and Cedar Grove are not aligned at Plantations Road 	Realign, signalize, and provide storage lanes for turning movements  Signal phasing and timing information developed; environmental constraints identified

Cedar Grove Realignment & Signalization

Major Improvement Concepts Long-Term

- Grade-separated diamond interchange at "5 Points"
- Controlled access road to the west of SR 1
- SR 24 widening (to four-lane section) in study area

Example of Diamond Interchange

Grade-Separated Diamond Interchange at "5 Points"

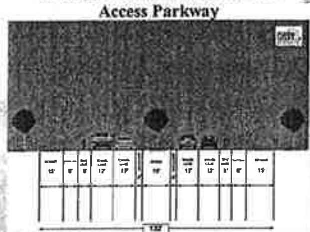
Existing	Proposed Concept
•At-grade signalized intersection with a 4-phase signal controlling all movements at the intersection	•Grade-separated diamond interchange •Two 3-phase traffic signals at either end of the US 9/SR 18 overpass to handle traffic from these roadways and the SR 1 exit ramps •Through traffic on SR 1 would pass under the overpass without delay.

Grade-Separated Diamond Interchange

- Study has determined:
  - The cycle length, phasing and timings needed
  - Lane configuration needed (left- or right-turn lanes and storage lengths)
  - Ramp lengths

Controlled Access Roadway

Cross Section of New Controlled Access Parkway



Other Intersections with Parkway

- US 9, SR 23/285, Rd 277, Rd 283, SR 24, Rd 274, Rd 273
- Study has determined:
  - All require signalization
  - The cycle lengths, phasing and timings needed
  - Lane configurations needed (left- or right-turn lanes and storage lengths)

SR 24 – Four Lanes

Land Use and Policy Recommendations

- Development Patterns: To fulfill the terms of the memorandum of agreement, Sussex County will:
  - Incorporate by amendment compact, mixed-use activity centers as the preferred pattern of land development in coastal Sussex County in the Sussex County Comprehensive Plan
  - Amend the Future Land Use map in the Sussex County Comprehensive Plan to show the general locations of compact, mixed-use activity centers based on the preferred land use scenario
  - Adopt and implement a zoning ordinance, zoning map, and subdivision ordinance to provide for the development of compact, mixed-use activity centers
  - Use a voluntary program of transfer of development rights as a tool to implement compact, mixed-use activity centers and livable, smart growth

Land Use and Policy Recommendations

- Interconnectivity:
  - Commercial Uses – Highway Corridor Overlay Zone – Modify existing county ordinance to strengthen requirements for cross-access easements and interconnections by providing better guidance on the placement of these connections
  - Residential and Mixed-Use Development – Take proactive role in the review of development proposals to ensure that an internal local street network is created for larger projects to improve access among buildings and adjacent land uses; develop interconnectivity guidelines

Land Use and Policy Recommendations

- Urban Design: Develop urban design standards to address the street realm of buildings, parking, sidewalks, and landscaping – if parkway is developed, it may be possible to redevelop SR 1 in a manner that is more urban in character – "reinvent the suburban strip"
- Controlled Access Parkway: Declare it limited access; prepare a corridor preservation plan and a memorandum of understanding between DelDOT and Sussex County regarding up-zoning along the parkway and coordinated development review

Next Steps in the Transportation Development Process

Studies Emanating from the SR 1 Land Use & Transportation Study

1. "5 Points" Grade Separation & Local Circulation
2. Controlled Access Parkway Alignment to SR 24
3. Controlled Access Road Alignment – from SR 24 East
4. SR 1 Bicycle/Pedestrian Improvements
5. Park-and-Ride Usage and Planning
6. Transit Needs

DelDOT Project Pipeline

Pipeline Step		*Work Activity*		*Time Frame*
Project Development*	=	Work with the Public to Define Problem, Possible Solutions and Preferred Alternative	=	12-36 months
Engineering*	=	Produce Plans and Specifications	=	12-24 months
Construction*	=	Build Improvement	=	Depends on complexity of improvement

* Funding for each step based on relative priorities as established in annual budget process – community support very important

Compliance with National Environmental Policy Act (NEPA)

Environmental Assessment or Environmental Impact Statement, depending on extent of effects anticipated on:

- Natural systems – wildlife, vegetation, water & air quality, wetlands & floodplains, etc.
- Land use – land acquisition & displacement, parklands, farmland, consistency with other plans, etc.
- Socioeconomic systems – historic & archaeological resources, aesthetics/visual impacts, community disruption, environmental justice, pedestrians/bicyclists, etc.

SR 1 Land Use & Transportation Study Remaining Tasks

Remaining Tasks

1. Mailing to Households on Public Information Meeting
2. Public Information Meeting
3. Final SR 1 Newsletter
4. Plan Technical Report

Upcoming Public Information Meeting

Public Information Meeting

- Date: Saturday, March 1, 2003
- Time: 11 AM to 3 PM, open-house format with presentations at 12 noon and 1:30 PM, followed by questions and answers
- Location: Cape Henlopen High School
- Agenda: Draft Transportation Plan Elements

Additional PAC Member Comments

State Route 1 Land Use & Transportation Study
Public Advisory Committee #11
Meeting Summary

February 12, 2003

The draft transportation plan elements were presented and discussed at the final meeting of the Public Advisory Committee (PAC).

They include:

- Short-Term/Immediate Improvements
  - Improve signal phasing
    - SR 1 & Rehoboth Avenue
    - SR 1 & Dartmouth Drive/Kings Highway
  - Increase turning lane length – Plantations Road & SR 24
  - Install signal – Plantations Road & Road 274
  - Realign Wescoats Road with 269A
  - Upgrade pavement – Roads 283 (Cedar Grove Road) and 277 (Robbinsville Road)
  - Improve signage
    - Additional travel sign at US 113/SR 1 split
    - Real-time travel information – US 113/SR 1 split
    - Better signage for 1B into Rehoboth Beach
    - Signage for park-and-ride on Country Club Road
  - Complete signal coordination & phasing on SR 1 (anticipated 10% improvement)
- Mid-Term Improvements (within 3 years)
  - Bicycle & pedestrian improvements along SR 1
  - Realignment & signalization of Postal Lane/Cedar Grove Road & Plantations Road
- Long-Term Improvements (beyond 3 years)
  - Grade-separated diamond interchange at "Five Points"
  - New controlled access parkway
  - SR 24 with four lanes in study area
- Land Use/Policy Recommendations
  - Development patterns
    - Incorporate mixed-use activity centers in Sussex County's Comprehensive Plan

    - Adopt and implement ordinances to provide for the development of activity centers
    - Use a voluntary program of transfer of development rights as a tool to implement activity centers and livable, smart growth
  - Interconnectivity
    - Modify county ordinance to strengthen requirements on placing cross-access easements and interconnections
    - Take proactive role to ensure an internal local street network is created for new larger projects to improve access; develop interconnectivity guidelines
  - Urban design
    - Develop urban design standards to address buildings, parking, sidewalks, and landscaping
  - Controlled access parkway
    - Declare it limited access; prepare a corridor preservation plan

These transportation elements, and a review of the recommended land use plan, will be presented at a public information meeting scheduled for March 1 at Cape Henlopen High School from 11 am to 3 pm, with presentations at noon and 1:30. All PAC members are encouraged to attend.

The following areas were discussed regarding the transportation elements presented:

- The longer turning lane recommended as a short-term improvement for Plantations Road can be accommodated within the existing right-of-way.
- Most PAC members agreed that the new proposed parkway should be legally designated as controlled access. DelDOT agreed that it would take any actions necessary in coordination with Sussex County.
- One member would like to see additional diamond interchanges at US 9 and SR 24.
- Any park-and-ride studies should be conducted with full understanding of other ongoing activities, particularly at Five Points.
- If for some reason the recommended parkway is not constructed, DelDOT and Sussex County would have to look for another solution. Doing nothing would be unacceptable. The best way to see the new roadway built is to support it at public meetings and through letters and emails to the Department and County.
- Lawrence Lank explained that Sussex County will be implementing ordinances and design standards and reviewing new developments for interconnectivity.

The entire study team would like once again to thank each and every PAC member for working with us on this lengthy effort. All your time and trouble are appreciated.

State Route 1 Land Use/Transportation Study

Public Meetings
Presentations and Summaries

Prepared For:
Delaware Department of Transportation

Prepared By:
DMJM+HARRIS
516 East State Street
Trenton, NJ 08609

State Route 1 Land Use/ Transportation Study

A Joint Effort of:

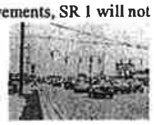
Sussex County
and the
Delaware Department of
Transportation DelDOT

Why This Study?

- The resort area continues to grow at a rapid rate. By 2020, 33,735 more people will live in Sussex County – many of them in the resort area – and more than 5 million will visit each year.

Why This Study? (cont.)

- Local residents already find getting from here to there tough during the tourist season, if SR 1 must be used.
- Despite many improvements, SR 1 will not be able to handle the expected traffic.
- Alternative solutions must be created.



Study Approach

- Build on the results of the Grid Concept Study completed in 1999 to develop a Land Use and Transportation Plan in the SR 1 corridor between Five Points and Rehoboth/Dewey Beach.
- Define desired growth and the transportation system needed to support it.

Study Objectives

- Increase local mobility by developing alternate road linkages and connections
- Provide a variety of ways to travel
- Reduce congestion
- Improve safety
- Maintain the character of the study area
- Gain public acceptance of study recommendations

Public Advisory Committee (PAC)

- 30+ representatives of state, county, and regional agencies, public interest groups, and the general public
- Will meet 9 times during the 18-month study

PAC Purpose and Role

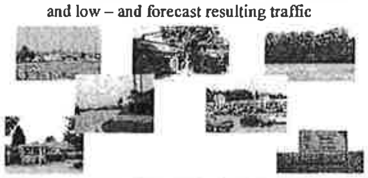
- Represent their constituencies, advise DelDOT and Sussex County about issues and concerns regarding the study
- Work with DelDOT and Sussex County to identify feasible solutions to meet study objectives
- Act as liaisons to "home" organizations – communicate study findings and solicit feedback

Grid Concept Study

- Five projects were identified; they are not part of the current study
- Now in pre-design:
  - Nassau pedestrian/bicycle connection
  - New third lane and widening of shoulder on southbound SR 1 from north of Five Points to north of SR 24
  - Rehoboth entrance improvements
- Scheduled for project development in FY 2003:
  - New bike/ped connection between Old Landing/Airport roads & Rehoboth/Dewey Beach
  - Park-and-ride lot north of Five Points

Work Plan Elements

- Develop 3 land use scenarios – current, high and low – and forecast resulting traffic



Land Use & Traffic Scenarios

- Different land uses create different amounts of traffic (numbers of trips).

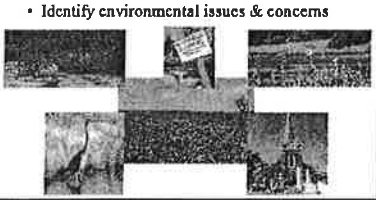
- The number of trips is identified for each new development, with assumptions about how vacant properties will be developed.
- Existing traffic is projected to show what traffic would be like in 2025.
- The traffic that would be created by the new and assumed uses is added.

Land Use & Traffic Scenarios (cont.)

- A transportation model predicts where this traffic would travel on the roads and shows how well it would flow.
- The result – a clear indication of where improvements are needed in the future.

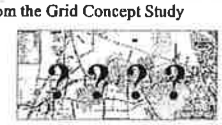
Work Plan Elements (cont.)

- Identify environmental issues & concerns



Work Plan Elements (cont.)

- Identify the transportation impacts & define the transportation system for each scenario
- Better define the most feasible components from the Grid Concept Study

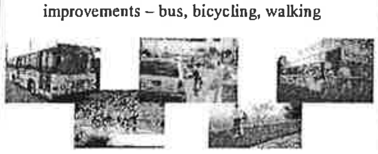


Work Plan Elements (cont.)

- Recommend a land use plan
- Identify the transportation system to serve the land use plan
  - Roadway alignments
  - Roadway widths

Work Plan Elements (cont.)

- Identify additional transportation improvements – bus, bicycling, walking



Work Plan Elements (cont.)

- Prioritize improvements for project planning & development
  - Immediate
  - Short term
  - Long term

Work Plan Elements (cont.)

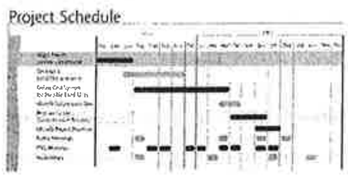
Sussex County:

Include the study findings in its Comprehensive Plan update

DelDOT:

Commit to a plan for constructing roads & other transportation improvements within same 20-year planning horizon used by county

Project Schedule



Ways To Stay Involved

- Attend the other three public information meetings – like this one – where study findings will be discussed.
- Get on our mailing list for newsletters and meeting announcements.
- Check Sussex County's web site for newsletters and announcements (www.sussexcounty.net).
- Communicate with PAC members.

SR 1 Land Use & Transportation Study
A joint effort of Sussex County and DelDOT

Public Meeting Summary

Cape Henlopen High School
August 15, 2001

Below is a summary of the question-and-answer session following the presentation introducing the SR 1 Land Use/Transportation Study. Individual comments made during the open house segment of the meeting, as well as comments received in writing during the meeting and from the newsletter comment card, are summarized in the study issues log.

Question: How many members of the PAC are residents of Sussex County? Is there room on the PAC for more members?

Response: About eight PAC members identified themselves as residents. Several other Sussex County residents who are PAC members were unable to attend. Most of the other PAC members represent key agencies that have an interest in the study. Anyone can attend PAC meetings; the public will also be given the opportunity to speak at these meetings.

Question: When will other public meetings be held?

Response: We have indicated the timeframes for public meetings in the newsletter and on the schedule board. Specific dates have not yet been set.

Question: Are you planning to change land use and zoning? The grid will generate more traffic. You do not appear to be looking at the larger impact on quality of life, why tourists come here. SR 1 now looks like Anyplace USA. How is this proposal in any way consistent with the Governor's agenda, a Livable Delaware? This is the opposite of trying to contain sprawl. It will make realtors and developers happy.

Response: This area is growing. It will need a transportation network. The area has been designated as a growth area in Sussex County's Comprehensive Plan. "Livable Delaware" requires that DelDOT provide access and mobility.

Question: The grid system takes interstate traffic through communities. We will need a car for everything. How does this study address that problem?

Response: This study is intended to provide mobility to the people who live and work in the area. It will also address providing alternate modes.

Question: According to the newsletter, DelDOT is fixing the signal timing on SR 1. What kind of progress has been made? This could help to bring some immediate relief.

Response: The infrastructure is in place and the system is up and running. We are now working to program it correctly.

Question: Is the signal system entirely electronic? Is there any feedback mechanism to reflect real-time traffic conditions?

Response: DelDOT flies over these intersections on summer weekends, and people on the ground are monitoring the effectiveness of the system and making adjustments as needed. Please let us know about any signal problems you are experiencing.

Comment: Route 1D has already failed. You are going to trap us in our homes. The traffic to Bethany and Fenwick needs to use US 113. DelDOT should assist Rehoboth Beach in building a parking garage.

Question: Builders are changing AR1 zoning to commercial. How are you going to address that?

Response: There have been very few rezonings in recent years.

Comment: You can't do anything with the roads without a firm land use plan. Farmers are being put in the position where they want to sell because development is going in all around them.

Comment: As a farmer I object to your suggestion that I can't sell if I want to. A lot of the Townsend land was grandfathered in.

Comment:	Slot machines on the ferries, which are not used during the winter, would raise money for farm preservation efforts.
Question:	You need to check out what goes on in Sussex County Council.
Response:	Council is not rezoning for commercial.
Comment:	I would like to speak in favor of DelDOT. Every highway that feeds into this area has been dramatically improved. Others are coming here for the same reason the people in this room did. You can't stop development. We are now in a state of crisis. The grid system is a partial solution. People are creatures of habit. For example, there is an alternate entrance into Rehoboth Beach, but people don't use it.
Comment:	I remember when there was nothing here, nothing to do except for the beach. I welcome development. It's mostly people from elsewhere who want it to stop.
Comment:	DelDOT has messed up 5 Points so it's even worse than it was. We need overpasses, underpasses, and cul-de-sacs. That's the only way to handle the additional 1500 houses that are planned. We should stop townhouses from being built on Savannah Road, which can't handle the traffic.
Comment:	I would like to formally request that DelDOT look at these roads as a system. In particular, it should look at the area that includes the Grotto entrance, the proposed development opposite Lowes, and the intersection with Wescoats Road.
Question:	Is there a possibility of getting train service here?
Response:	DelDOT is initiating a feasibility study for rail passenger service from Wilmington to Dover. Rail service is not anticipated in this area in the near future.
Question:	You say we should communicate with PAC members. Are their telephone numbers in the newsletter?
Response:	No, we don't want to intrude on their personal lives since they are already donating a lot of time and

	effort. If you contact us we will see that the person receives your request and can follow up with you.
Comment:	Please consider putting in at least one service road instead of widening SR 1.
Question:	Are the maps displayed here available on the Internet?
Response:	No, they are still a work in progress. No grid lines have changed since the 1999 study was completed.
Question:	Why are developers required to dedicate right-of-way?
Response:	The county can't require that; it is a voluntary program. The state can request it, but cannot insist on it.

State Route 1 Land Use & Transportation Study

February 6, 2002
Public Information Meeting

A Joint Effort of:

Sussex County
and the
Delaware Department of Transportation DelDOT

Meeting Overview

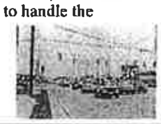
- Learn tonight about:
  - The project work plan
  - Land development & traffic trends in the study area
  - Traffic impacts of the Base Land Use Scenario ---forecasts for 2007 and 2025

Why This Study?

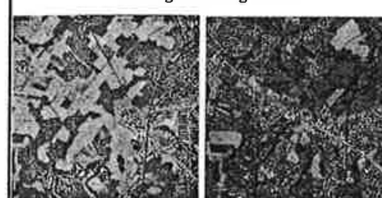
- The resort area continues to grow at a rapid rate. By 2020, 33,735 more people will live in Sussex County – many of them in the resort area – and more than 5 million will visit each year.

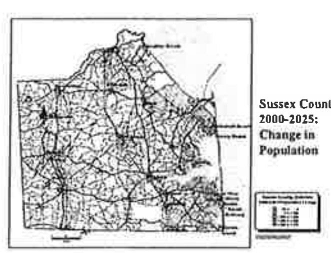
Why This Study? (cont.)

- Local residents already find getting from here to there tough during the tourist season, if SR 1 must be used.
- Despite many improvements, SR 1 & other roads will not be able to handle the expected traffic.
- Alternative solutions must be created.

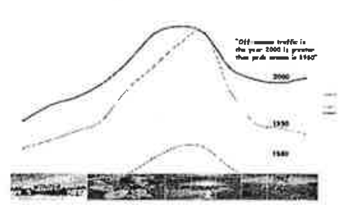


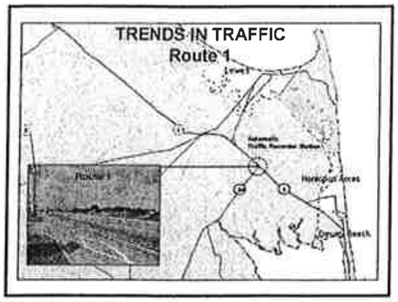
"Changes Through Time"

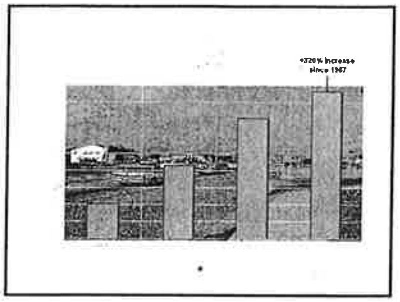


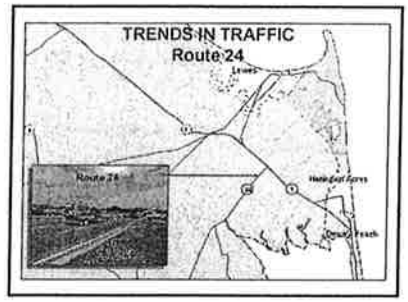


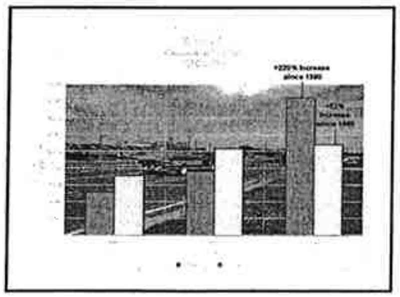
Sussex County 2000-2025: Change in Population









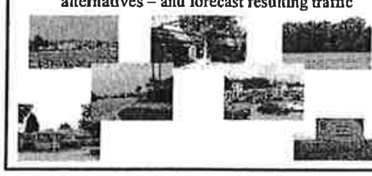


Study Objectives

- Increase local mobility by developing alternate road linkages and connections
- Provide a variety of ways to travel
- Reduce congestion
- Improve safety
- Maintain the character of the study area
- Gain public acceptance of study recommendations

Work Plan Elements

- Develop land use scenarios – a base and alternatives – and forecast resulting traffic



Land Use & Traffic Scenarios

- Different land uses create different amounts of traffic (numbers of trips).

- The number of trips is identified for each new development, with assumptions about how vacant properties will be developed.
- Existing traffic is projected to show what traffic would be like in 2025.
- The traffic that would be created by the new and assumed uses is added.

Land Use & Traffic Scenarios (cont.)

- A transportation model predicts where this traffic would travel on the roads and shows how well it would flow.
- The result – a clear indication of where improvements are needed in the future.

Work Plan Elements (cont.)

- Identify environmental issues & concerns

Work Plan Elements (cont.)

- Recommend a land use plan
- Identify the transportation system to serve the land use plan
  - Roadway alignments
  - Roadway widths

Work Plan Elements (cont.)

- Identify additional transportation improvements – bus, bicycling, walking

Work Plan Elements (cont.)

- Prioritize improvements for project planning & development
  - Immediate
  - Short term
  - Long term

Work Plan Elements (cont.)

Sussex County:

Include the study findings in its Comprehensive Plan update

DelDOT:

Commit to a plan for constructing roads & other transportation improvements

Public Advisory Committee (PAC)

- 30+ representatives of state, county, and regional agencies, public interest groups, and study area residents
- Have met 5 times since June 2001
- Meet about every 6 weeks

SR 1 Study Travel Model Methodology

☑ (1) Collect data regarding traffic counts and other information about the roadway system in the Study Area.

☑ (2) Collect data from Sussex County on existing, approved, and proposed residential and commercial land development in the Study Area.

☑ (3) Estimate where and how many new vehicle trips will be added to the roadway system with future development.

☑ (4) Build traffic simulation model representing Base Land Use Scenario.

☑ (5) Analyze traffic impacts of Base Land Use Scenario (delay, speed, pollution).

☑ (6) Report findings to Public Advisory Committee (PAC) and public for review and comment.

☐ (7) Analyze traffic impacts with additional land use scenarios.

What is the Base Land Use Scenario?

- Base Land Use Scenario represents the "base case" for the study; a benchmark
- Base Land Use Scenario includes:
  - currently <u>in place development</u>
  - <u>new development under construction</u>
  - <u>& proposed development</u> in the review process (both residential and commercial)
- Represents what is most likely to happen in the study area

So How Much New & Proposed Development is in the Base Land Use Scenario?

- 3,129 new residential units
- 100 acres of new commercial properties

Traffic Impacts of the Base Land Use Scenario

- Performance in 2007 of most signalized intersections within study area will deteriorate compared to 1998
  - Longer delays and longer lines in 2007
  - Only 3 signalized intersections will continue to operate about the same in 2007
- Major collectors and arterial streets feeding local traffic to SR1 will experience longer delays and lines in 2007
- Movement of local traffic will be greatly affected in 2007
- By 2025, all signalized intersections will fail in their operation and congestion and delay will be rampant

Some Other Traffic Measures Looked At

- Vehicle Miles Traveled (VMT) – total miles driven by all motorists – a key statistical measure of motor vehicle travel
- Vehicle Hours Traveled (VHT) – total number of hours spent driving by motorists
- Average speed – average motor vehicle speed

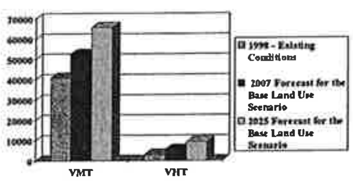
Traffic Measures

Traffic Measures	1998 - Existing Conditions	2007 Forecast for the Base Land Use Scenario	2025 Forecast for the Base Land Use Scenario
VMT	40,904	52,465	65,726
VHT	2,940	5,352	9,256
Average Speed	13.91 MPH	9.80 MPH	7.10 MPH

Percentage Change

Traffic Measure	1998 to 2007 Forecast for the Base Land Use Scenario	1998 to 2025 Forecast for the Base Land Use Scenario
Change in VMT	+ 28% (+11,561)	+ 61% (+24,822)
Change in VHT	+ 82% (+2,412)	+ 214% (+6,316)
Change in Average Speed	-42% (-4.11 MPH)	-96% (-6.81 MPH)

Increase in VMT and VHT



Decrease in Average Speed

Conclusions

- Traffic measures indicate the existing roadway network cannot sustain the traffic resulting from the 2025 Base Land Use Scenario
- Overall, measures indicate a highly deteriorated quality of life

Land Use & Transportation Study
A joint effort of Sussex County and DelDOT

Public Meeting Summary

Rehoboth Convention Center
February 6, 2002

Below is a summary of the question-and-answer session following the presentations. Individual comments made during the open house segment of the meeting, as well as comments received in writing during the meeting and from the newsletter comment cards, are summarized in the study issues log.

Question: You are showing conditions for 2007 and for 2025. Are you assuming that DelDOT can do nothing in the next 23 years to improve the situation?

Response: These numbers are being used for planning purposes. DelDOT has a number of projects under construction and in the pipeline and it will continue to address transportation needs throughout the state. We use 2025 as a target date; we must think now about the future and what kinds of improvements we need to put in place to avoid the kinds of traffic impacts that are likely to occur if we do nothing or if we do not take a comprehensive approach. One of the goals of this study is to determine what assumptions should be made about land use so DelDOT can develop a transportation system that supports it. Discussions about shaping land use are necessarily long range in nature.

Question: Has DelDOT done research on the percentage of traffic that is going to places like Ocean City versus the traffic that has the study area as a destination?

Response: Our model shows that about 28% of the traffic on SR1 in the study area is through traffic. We believe much of that traffic will choose alternate routes once the capacity of SR 1 is exhausted. It is important to note that this study is concerned about local generators of traffic; at the rate at which the area is developing, local traffic will be enough to cause very severe congestion in the future, as well as all the other issues related to it such as more accidents and air pollution.

Comment:	We have consistently underestimated growth in the past. We should build a structure that will accommodate high volumes of traffic first and then the land uses will follow.
Question:	Haven't these studies been done before?
Response:	Studies have been done; in fact, this effort is a follow-up to a grid concept study that was done a few years ago. The difference here is that instead of letting land use proceed and then building transportation to support it, or building highways before the area is fully developed, we are trying to marry land use and transportation so both proceed simultaneously. We believe this approach will give us the best value.
Question:	What influence can DelDOT have on Sussex County? Can DelDOT demand changes?
Response:	Sussex County and DelDOT are partners for this effort. We have a memorandum of agreement that commits each of us to implement the results of a publicly supported plan.
Question:	Why is Sussex County allowing development to continue?
Response:	In the early 1970s, Sussex County designated the SR 1 corridor for commercial development, and this designation remains. Sussex County does withhold approval on developments that appear to infringe on the quality of life in the area.
Question:	What is the timetable for this effort?
Response:	This study will be completed this fall. The timetable for implementation will depend on the plan that is developed and adopted.
Question:	Why didn't the state make other safety and operational improvements when it blacktopped SR 1?
Response:	DelDOT has a number of ongoing projects that will improve safety and traffic flow on SR 1, such as the third-lane addition. A representative of the State Police also serves as a PAC member.
Question:	Do you have any figures on how much traffic the outlets generate?
Response:	We don't have them here, but we will get them to you.
Question:	Does DelDOT have figures on the impacts of the Dover Bypass?
	Local traffic appears to move better, although that will probably change as development continues.

Comment:	Please uninstall the computer that controls the traffic signals on SR 1. It's terrible.
Question:	How is this study being incorporated in other planning documents such as DelDOT's Capital Improvement Program and Sussex County's Comprehensive Plan?
Response:	Elements of this study can be incorporated in both processes even before the study is completed. The results will be explicitly incorporated in future versions.
Question:	Will Sussex County change the boundaries of the Development District in its updated Comprehensive Plan?
Response:	The Development District will not include any of the lands that have been designated as environmentally sensitive.
Question:	Why does DelDOT consistently sign off on "no negative impact" from the development it reviews?
Response:	DelDOT does not sign off on every review, and often the Department recommends changes needed to make the development acceptable from a transportation standpoint.
Question:	Is there any commitment to the results of this study?
Response:	The commitment takes several forms. The involvement of the Public Advisory Committee and the general public should ensure that any plan developed is supported by local residents. The role of Sussex County and DelDOT is primarily to help narrow the list of changes and improvements being considered by identifying what is possible from a fiscal, practical, and environmental viewpoint. The memorandum of agreement between the county and the state is a formal commitment to the study results.
Question:	How likely is it that this plan will be implemented?
Response:	The plan will be implemented, although the time frame is unknown right now. DelDOT has made a big investment in this study with the expectation that it will result in actual projects. Also, Sussex County's 1997 Comprehensive Plan and 2002 Long-Range Transportation Plan include mobility elements that have been acted on. Sussex County is eager to see projects that will enhance transportation in the area.

Comment:	I believe the improvement that results from this study will have to be major. Adding a lane here or there will not solve the problem. I'm afraid it will take a devastating storm to get DelDOT and Sussex County to recognize the transportation problems in the area.
Question:	Are there places elsewhere in Delaware that exhibit the traffic conditions projected for this area in 2007?
Response:	Some areas in the northern part of the state are approaching those conditions.
Question:	Has DelDOT conducted other studies like this in the Wilmington area?
Response:	The closest example is the Churchman's Crossing study. We are hoping that this current study will be a model for similar studies in other parts of the state.
Question:	Are you considering public transit for this area?
Response:	That will be an important element of the land use scenarios. A certain density must be achieved to make public transit practical.

State Route 1 Land Use & Transportation Study

September 18, 2002
Public Information Meeting

A Joint Effort of:

Sussex County
and the
Delaware Department of Transportation DelDOT

Meeting Overview

Learn tonight about:

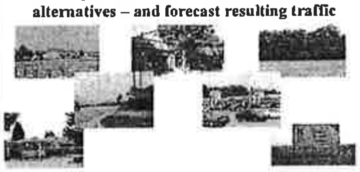
- The use of Activity Centers to focus land use
- The effect of Activity Centers on transportation in 2025
- The environmental screening process

Review – Study Objectives

- Increase local mobility by developing alternate road linkages and connections
- Provide a variety of ways to travel
- Reduce congestion
- Improve safety
- Maintain the character of the study area
- Gain public acceptance of study recommendations

Review – Work Plan Elements

- Develop land use scenarios – a base and alternatives – and forecast resulting traffic



Review – Work Plan Elements (cont.)

- Identify environmental issues & concerns

Review – Work Plan Elements (cont.)

- Recommend a land use plan
- Identify the transportation system to serve the land use plan
  - Roadway alignments
  - Roadway widths

Review – Work Plan Elements (cont.)

- Identify additional transportation improvements – bus, bicycling, walking

Review – Work Plan Elements (cont.)

- Identify and prioritize improvements for project planning & development
  - Immediate
  - Short term
  - Long term

Study Implementation

Sussex County:
- Refer to study in its Comprehensive Plan update
- Consider findings of study for ordinances

DelDOT:
- Commit to a plan for constructing roads & other transportation improvements
- Enter projects into DelDOT's Pipeline Process (competing against projects statewide for funding)

Review – Public Advisory Committee (PAC)

- 30+ representatives of state, county, and regional agencies, public interest groups, and study area residents
- Have met 8 times since June 2001
- Meet about every 6 weeks

Land Use Scenarios

Land Use Scenarios

The PAC analyzed & compared the following scenarios:

- Base Land Use Scenario
- Build Out to Plan Scenario
- Activity Center Scenario

Base Land Use Scenario

A limited growth scenario that assumes only development currently under construction and in the pipeline.

Build Out to Plan Scenario

A growth scenario that depicts complete "build-out" of the study area under the existing zoning and land use plan.

The PAC recommended this land use scenario as the basis for future development in Sussex County.

Activity Center Scenario

A growth scenario that depicts complete "build-out" of the study area in a more compact mixed-use settlement pattern that also reduces residential densities outside the centers to help preserve open space and farmland.

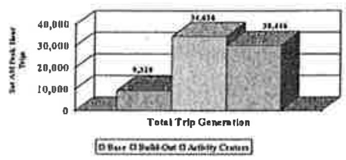
Activity Center Concept

- Sustainable, planned development
- Mixed land uses; creates focal points or gathering points
- Design at a pedestrian scale
- Walkable & bikeable neighborhoods
- Creates housing opportunities & choices
- Helps make transit feasible
- Reduces auto dependency
- Helps reduce infrastructure costs

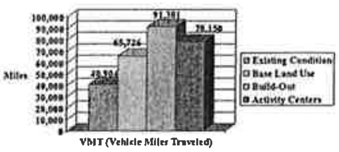
Elements of Activity Center Land Use Scenario

- Four multi-use centers west of SR 1 between SR 23 and SR 24, including one near new school site and one near new Beebe center
- Neighborhood retail & a mix of housing types in a more compact form with open space
- A reduced density of dwelling units/acre on land outside activity centers; balance of density transferred into centers
- Commercial land develops as now zoned (same as "Build-Out to Plan" scenario)

Trip Generation for Base, Build Out to Plan, & Activity Center Scenarios



Vehicle Miles Traveled
(Saturday AM Peak Hour)



Vehicle Hours Traveled
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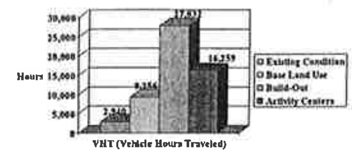
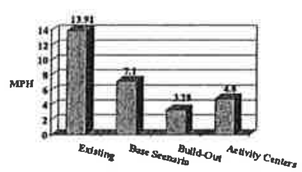
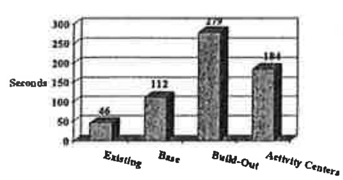


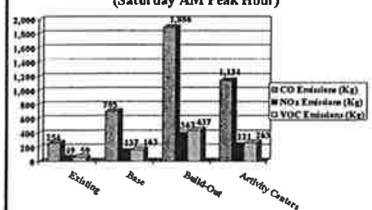
Average Speed
(Saturday AM Peak Hour)



Signal Delay
(Saturday AM Peak Hour)



Environmental Measures
(Saturday AM Peak Hour)



Why PAC Chose Activity Centers:

- Reduce the number of times a person must travel to SR 1
- Reduce the number of auto trips
- Provide walkable and bikeable neighborhoods
- Help make public transit feasible
- Help reduce infrastructure costs – water, sewer, and local roads
- Promote a sense of community
- Help preserve open space & farmland

Preliminary Environmental Screening

Preliminary Environmental Screening Goals

- Identify existing environmental issues
- Develop and shape the transportation plan strategies
- Avoid or minimize adverse environmental impacts

Preliminary Environmental Screening Process

- Data collection
- Environmental inventory mapping
- Transportation strategy screening

Preliminary Environmental Inventory Data

- Geology and Soils
- Groundwater
- Sussex County Recharge Areas
- Water Quality
- Watersheds
- Wetlands (SWAMP)
- Floodplains
- Endangered and Threatened Species/Habitats
- Forested Areas
- Natural Areas Inventory
- Reserved Open Space
- Natural Heritage Program Areas
- State Agricultural Districts
- State Agricultural PDR Districts
- Nature Preserves
- Conservation Easements
- State Resource Areas
- Historic Resources
  - National Register Historic Sites
  - National Register Historic Districts
  - National Register Historic Archaeological Areas
  - Inventoried Resources
- Septic System Areas
- Well-Head Protection Areas
- Known/Potential Contaminated Sites

Preliminary Environmental Mapping

- Wetlands and floodplains
- Wellhead protection/groundwater recharge areas
- Agricultural resources
- Historic resources
- Parklands/open space
- Known/potential contaminated sites
- Threatened and endangered species

Use of Preliminary Environmental Data To Screen Transportation Strategies

- Component of overall evaluation matrix
- Develop and shape transportation strategies
- Eliminate fatal flaws
- Assess permitability
- Avoid or minimize environmental impacts

Next Steps

- Complete environmental screening
- Develop transportation plan & present to PAC and public for review
- Finalize transportation plan & present to PAC and public

Land Use & Transportation Study

A joint effort of Sussex County and DelDOT

Public Meeting Summary

Virden Center
September 18, 2002

Below is a summary of the question-and-answer sessions following the presentations. Comments received in writing during the meeting and from the newsletter comment cards are summarized in the study issues log.

Question:	I am a resident of Plantations Road. Are you planning to siphon some of the traffic from SR 1 onto this road? Also, I understand the SR 24 study calls for capacity improvements to Plantations Road. Can you tell me what that could entail? Will they tear down our houses?
Response:	Any recommendations that came from the SR 24 study are conceptual only. Although capacity increases may be required, it is too soon to know what form they might take.
Question:	An expansion of Plantations Road to four lanes would place the road within five feet of my townhouse. What happens to my sense of community and open space then, and especially air quality? That's an adverse effect on my quality of life.
Response:	Once again, we do not know what will happen to Plantations Road in the future.
Question:	I live in Edgewater Estates and I would like to object to the pollution and noise that would result from the construction of a 700-car parking lot (park-and-ride) near my property.
Response:	That location was originally identified during the old grid study, but it probably will not be used. Construction may take the form of several mini park-and-ride facilities. No specific sites have been identified yet.
Comment:	DelDOT puts everything into a funnel. You need to build connections that give us alternatives to SR 1 now.
Response:	This study is addressing that need.

Question: It's foolish to assume that build-out is the only possible result. Also, where is the open space in the Residential Planning Center now being built at Five Points?

Response: There is a lot of open space. I can show it to you on the plans if you are interested.

Question: Is the grid system still on the table?

Response: Some pieces of the grid study have been implemented; some builders have voluntarily made provisions for connections to be built. To the extent we can, we will build connections so all travel does not have to take place on SR 1. We do not have any legal authority to insist that developers set aside land for rights-of-way. Some projects from the grid study are also underway: the widening of SR 1 to three lanes southbound between Five Points and SR 24, a bicycle/pedestrian project in Nassau; and a study to identify improvements to the entrance to Rehoboth Beach.

Comment: DelDOT should build a cloverleaf at Five Points. You have no business going down Plantations Road.

Question: Why do you think people will use buses and walk and bicycle 20 years from now when they don't do that now?

Response: Activity Centers will provide the kind of density that could support public transit and the kinds of bikeways and sidewalks that will enhance bike/ped as attractive modes.

Question: Why can't you put a moratorium on development?

Response: This is the kind of issue that should be raised with Sussex County Council at the October 1 hearing on the Comprehensive Plan. Many people in this area view their land as an investment; we can't just tell them they can't sell to a developer after all.

Question: Why is Sussex County considering expanding the Development District?

Response: The Comprehensive Plan expands only the environmentally sensitive developing area, not the Development District where the density is higher.

Question: Why doesn't the Comprehensive Plan increase the amount of environmentally sensitive land on the west side of SR 1?

Response: The hearing on the Comprehensive Plan is October 1. You should make your feelings known there.

Question:	Is this plan all DelDOT's? How many PAC members actually live in the study area?
Response:	At last count, about 17 PAC members live here or have this area as their primary professional responsibility. The newsletters and a board in the lobby list their names and the organizations they represent.
Question:	Are you saying people won't continue to go to Lowes, the supermarket, etc., if Activity Centers are developed? I don't see how they will reduce travel. I also doubt if retail stores will take the chance of moving into a center.
Response:	Activity Centers are designed to eliminate or shorten some of the trips, certainly not all of them. This concept has proven successful elsewhere. In fact, a Food Lion and a bank have already committed to the Village of Five Points, which is being developed in line with this concept.
Comment:	This study should include a sustainable conservation scenario that would account for such phenomena as global warming.
Question:	How much of the new development would be captured using the Activity Center scenario?
Response:	About half.
Question:	What will these Activity Centers do for the beach?
Response:	This concept cannot solve all the problems in the study area. It is also not the only work DelDOT is doing in this area. Other projects (such as improvement to the entrance to Rehoboth Beach) are underway and many transportation improvements are expected to result from this study.
Question:	This land use plan seems too anthropocentric. It doesn't address ecosystems.
Response:	Those kinds of issues should be taken up with County Council in relation to the Comprehensive Plan.
Comment:	You should follow Oregon's approach. You should buy up all the undeveloped land and create greenbelts. This would enhance ecotourism, create groundwater recharge areas, make agriculture more viable, etc. Activity Centers are too experimental.
Question:	Will all the Activity Centers include only new development? Won't that take a long time? What do we do about problems today.

Response: Yes. Other studies and projects are also underway. This study will include both short-term and long-term recommendations. Some of the less complex problems can be addressed right away.

Comment: The State Planning Office (and all state planning offices) are forcing development into areas that already have congestion. The development you propose should be farther inland. The towns here don't have the excess infrastructure required for more development.

Response: Land use issues should be discussed further with Sussex County Council.

Question: Why does your study focus on a peak hour in July? You should be looking at a mean hour to identify the kinds of improvements that are needed.

Response: It is standard transportation planning practice to study the worst-case condition. Anything less could be short-sighted.

Question: I am concerned about air quality in this area. What are you doing about the state's being in non-attainment for ozone?

Response: There are many causes for air pollution in Delaware. Permitting cars to move faster and getting as many cars as possible off the road will help to alleviate the rate of growth of pollution.

Question: Why aren't there more services like the Jolly Trolley? Many of the single people who come here would gladly use it.

Response: This study will also look at public transit.

State Route 1 Land Use & Transportation Study

Public Information Meeting #4
Saturday, March 1, 2003
Cape Henlopen High School

DelDOT

A Joint Effort of:

Sussex County
and the
Delaware Department of Transportation

DelDOT

Meeting Overview

Learn today about:

- The elements of the transportation and land use plan
- The next steps in the project development process

Review – Study Objectives

- Increase local mobility by developing alternate road linkages and connections
- Provide a variety of ways to travel
- Reduce congestion
- Improve safety
- Maintain the character of the study area
- Gain public acceptance of study recommendations

Review – Work Plan Elements

- Develop land use scenarios – a base and alternatives – and forecast resulting traffic

Review – Work Plan Elements (cont.)

- Identify environmental issues & concerns

Review – Work Plan Elements (cont.)

- Recommend a land use plan
- Identify transportation system improvements

Review – Work Plan Elements (cont.)

- Identify and prioritize improvements for project planning & development
  - Short term
  - Mid term
  - Long term

Study Implementation

Sussex County:

- Refer to study in its Comprehensive Plan update
- Develop supporting ordinances

DelDOT:

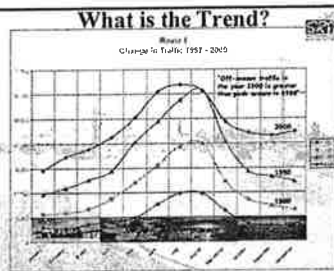
- Commit to a plan for constructing roads & other transportation improvements
- Enter projects into DelDOT's Pipeline Process (competing against projects statewide for funding)

Public Advisory Committee (PAC)

- 30+ representatives of state, county, and regional agencies, public interest groups, and study area residents
- Have met 11 times since June 2001

SR 1 Land Use & Transportation Study

What is the Trend?



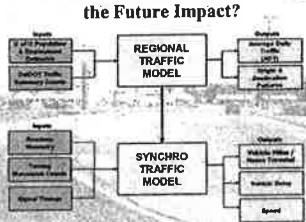
SR 1 Land Use & Transportation Study

What is the Future?

- For the "Base" Land Use Scenario (development in the "pipeline")
  - 3,129 new residential units
  - 100 acres of new commercial properties
- For the "Build-Out" Land Use Scenario
  - 21,010 new residential units
  - 203 acres of new commercial properties

SR 1 Land Use & Transportation Study

How Do We Measure the Future Impact?



SR 1 Land Use & Transportation Study

Travel Demand Analyses Conducted

- Measures of Effectiveness (MOEs) used to compare travel demand modeling results for the alternative concepts
- MOEs like vehicle miles traveled (VMT), vehicle hours traveled (VHT), average speed, delays at traffic signals were examined at two levels:
  - Study Area Analysis – What is the benefit of the alternative to the entire network in the study area?
  - SR 1 Analysis – What is the benefit of the alternative to SR 1 performance?

SR 1 Land Use & Transportation Study

"Build-out" Traffic Impacts

Network Measure	1998 Existing Condition	2007 Base Land Use	2025 Base Land Use * "Best Case"	2025 Build-Out to Plan ** "Worse Case"
VMT	49,904	52,403	65,720	91,380
VHT	2,948	5,352	9,356	27,830
Average Speed	17.91 mph	9.80 mph	7.10 mph	3.28 mph
Total Signal Delay (hrs)	2,001 hrs	4,145 hrs	7,749 hrs	25,692 hrs
Signal Delay/Veh (sec)	46 sec	74 sec	132 sec	279 sec

SR 1 Land Use & Transportation Study

Review of the Conceptual Transportation Alternatives Analyzed

SR 1 Land Use & Transportation Study

Conceptual Transportation Improvement Alternatives Examined

- Major alternatives – long-term transportation infrastructure improvement options or concepts
  - identified based on PAC and public suggestions
- Minor transportation improvements – mid-term and short-term improvement concepts (intersection improvements & realignments, signal optimization & coordination)
  - were coupled with each of the major alternatives
- Alternatives were evaluated using travel demand and simulation models to analyze the overall impact on the SR 1 study area

SR 1 Land Use & Transportation Study

Conceptual Transportation Improvement Alternatives

➢3 Major Alternatives Examined

- Two alternatives looked at adding capacity to existing transportation facilities
- Another looked at adding new capacity to the study area transportation system

SR 1 Land Use & Transportation Study

ALTERNATIVE 1

- Add Capacity to Road 275 and SR 24
  - Two sub-alternatives:
    - 1A → Grade-separated diamond interchange at "Five Points"
    - 1B → No grade separation

Alternative 1A

Alternative 1B

Alternative 1: Add capacity to Road 275 & SR 24, with/without diamond interchange at Five Points

General Findings

- **Showed localized improvements only;** would not significantly benefit overall network performance or SR 1 performance
- **Improvements along Road 275 would not have much impact on the performance of SR 1**

ALTERNATIVE 2

- **Commercial arterial concept for SR 1 with through and local lanes**
  - Separate local and through traffic (through traffic would include Rehoboth Beach/Dewey resort traffic)
  - Eliminate traffic signals along through lanes
    - Traffic signals located only along one-way local lanes
  - Provide slip ramps between through and local lanes
  - Three grade-separated diamond interchanges at Five Points, SR 24 and Rehoboth Avenue

Alternative 2

Alternative 2: Commercial arterial concept with through & local lanes with grade-separated diamond interchanges at Five Points, SR 24, and Rehoboth Ave.

General Findings

- Alternative 2 would provide negligible performance improvement in network-wide MOEs, some measures would deteriorate
- Network VMT & VHT would increase
- Significant traffic would result in the local lanes and lane volumes would exceed capacity
- Would result in delays and long lines; would require two local lanes and two express lanes in each direction
- Capacity issues would still remain at the diamond interchanges – this alternative would work effectively only if sufficient capacity were provided (6-7 lanes on overpass, 3-4 lanes on ramps, 2 lanes on slip ramps with long acceleration & deceleration lanes)

ALTERNATIVE 3

- **New roadway serving as a bypass to SR 1 within the study area with additional capacity added to SR 24**
  - Two sub-alternatives:
    - → 3A: Diamond interchange at Five Points
    - → 3B: No interchange

Alternative 3A

Alternative 3B

Alternative 3: new roadway concept

General Findings

- Alternative 3A (with grade-separated diamond interchange at Five Points) would provide the most significant benefit to future network-wide travel conditions compared to the other alternatives analyzed
- All three options south of SR 24 for this new roadway alternative would provide similar results
- Although VMT would increase, VHT would decrease
- More traffic would shift to the new roadway

Plan Elements

Plan Elements

- Short-Term/Immediate:
  - actions that require only signal coordination and phasing changes and, for some intersections or roadways, the development of preliminary and final engineering plans
  - policy initiatives
- Mid-Term: actions that require further project development and possibly right-of-way acquisition but could be constructed within a 3-year time frame
- Long-Term: complex actions that require additional project development and right-of-way acquisition and would take 3 or more years to go to construction, due to detailed environmental studies required to secure federal funding

Short-Term Improvements

- Optimize signal coordination on SR 1 – currently underway – expected to result in up to 10% improvement in corridor performance
- Intersection Improvements include:
  - Rehoboth Ave/SR1 (optimize signal performance)
  - Dartmouth Drive/Kings Hwy/SR1 (optimize signal performance)
  - Plantations Road/SR 24 and at Plantations Road/274 (improve turning movements & possible signalization)

Other Short-Term Improvements

- **Realign Wescoats Corner Road with Road 269A as a 4-way intersection as result of a dedication of right-of-way**
- **Upgrade Pavement on Roads 283 (Cedar Grove Road) and 277 (Robbinsville Road) with 11' travel lanes and 5' shoulders as recommended by SR 24 study**

Other Short-Term Improvements

- **Transit Service:**
  - Recommend a park-and-ride usage & planning study to determine the need for additional facilities, locations, and impact on study area transportation system
  - Recommend a detailed study of transit needs
  - Recommend better coordination & training of bus drivers on use of diamond lanes

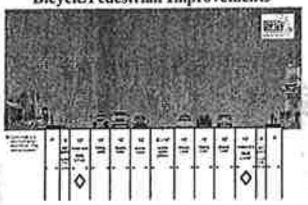
Other Short-Term Improvements

- **Signage:**
  - US 113/SR 1 split – one advance advisory sign in place, another needed for redundancy on approach to split
  - Use real-time electronic sign at US 113/SR 1 split to provide travel delay information
  - Improve signage for 1A/1B into Rehoboth Beach
  - Improve signage for park-and-ride near Country Club Road

Improvement Concepts
Mid-Term

- **Bicycle & Pedestrian Improvements along SR 1**
- **Realignment of Postal Lane/Cedar Grove Road and Plantations Road Intersection**

SR 1 Cross Section Showing Bicycle/Pedestrian Improvements



Cedar Grove Road Realignment/Signalization

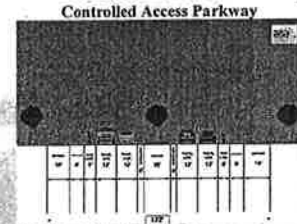
Major Improvement Concepts Long-Term

- Grade-separated diamond interchange at "Five Points"
- Controlled access road to the west of SR 1
- SR 24 widening (to four-lane section) in study area

Example of Diamond Interchange

Controlled Access Roadway

Cross Section of New Controlled Access Parkway



SR 24 – Four Lanes

Land Use and Policy Recommendations

- Development Patterns: To fulfill the terms of the memorandum of agreement, Sussex County will:
  - **Incorporate by amendment compact, mixed-use activity centers as the preferred pattern of land development in coastal Sussex County in the Sussex County Comprehensive Plan**
  - **Amend the Future Land Use map in the Sussex County Comprehensive Plan to show the general locations of compact, mixed-use activity centers based on the preferred land use scenario**
  - **Adopt and implement a zoning ordinance, zoning map, and subdivision ordinance** to provide for the development of compact, mixed-use activity centers
  - **Use a voluntary program of transfer of development rights** as a tool to implement compact, mixed-use activity centers and livable, smart growth

Land Use and Policy Recommendations

- Interconnectivity:
  - **Commercial Uses – Highway Corridor Overlay Zone – Modify existing county ordinance to strengthen requirements for cross-access easements and interconnections by providing better guidance on the placement of these connections**
  - **Residential and Mixed-Use Development – Take proactive role in the review of development proposals to ensure that an internal local street network is created for larger projects to improve access among buildings and adjacent land uses; develop interconnectivity guidelines**

Land Use and Policy Recommendations

- **Urban Design: Develop urban design standards to address the street realm of buildings, parking, sidewalks, and landscaping – if parkway is developed, it may be possible to redevelop SR 1 in a manner that is more urban in character – "reinvent the suburban strip"**
- **Controlled Access Parkway: Declare it limited access; prepare a corridor preservation plan and a memorandum of understanding between DelDOT and Sussex County regarding up-zoning along the parkway and coordinated development review**

Next Steps in the Transportation Development Process

Studies Emanating from the SR 1 Land Use & Transportation Study

1. "Five Points" Grade Separation & Local Circulation
2. Controlled Access Parkway Alignment to SR 24
3. Controlled Access Road Alignment – from SR 24 East
4. SR 1 Bicycle/Pedestrian Improvements
5. Park-and-Ride Usage and Planning
6. Transit Needs

DelDOT Project Pipeline

Pipeline Step		*Work Activity*		*Time Frame*
Project Development*	=	Work with the public to define problem, possible solutions and preferred alternative	=	12-36 months
Engineering*	=	Produce plans and specifications	=	12-24 months
Construction*	=	Build improvement	=	Depends on complexity of improvement

* Funding for each step based on relative priorities as established in annual budget process – community support very important

Public Comments

SR1 Land Use & Transportation Study
A joint effort of Sussex County and DelDOT

Public Meeting Summary

Cape Henlopen High School
March 1, 2003

Below is a summary of the question-and-answer sessions following the presentations. Comments received in writing during the meeting and from the newsletter comment cards are summarized in the study issues log.

Question:	Will the new controlled access parkway come off Route 16 and go to Long Neck Road? This seems like the only possible route. That could be a problem since 2400 homes are going in at Long Neck Road.
Response:	We don't know the exact alignment yet, although we do not anticipate starting as far north as Route 16. The next phase of this project will involve identifying the best right-of-way for the parkway and will include an assessment of its impacts on existing and proposed development.
Question:	Won't the bottleneck at Five Points just move to Rehoboth Avenue?
Response:	A study has already begun to address the problems at the entrance to Rehoboth Beach. We are planning to reduce both bottlenecks over time.
Question:	How much money has been allocated to projects in this area?
Response:	We don't have the numbers here, but the Capital Program is available on DelDOT's website.
Question:	Will you start the third lane construction before you improve the intersections?
Response:	We don't know that yet. Since the money has already been allocated for the third lane, it may begin first.

Comment:	A stop light is needed separating the two Plantations developments.
Question:	Will DelDOT be constructing a road to provide access to Home Depot from the back?
Response:	We have no plans for doing that.
Comment:	You need a plan for the overall area, not just travel to Rehoboth Beach.
Question:	What are the cost and timeline for implementing the recommendations for improved signage? Will that be done by Memorial Day? We must get people who are going to the Maryland beaches off SR 1.
Response:	We don't know those details yet. We are just now making the recommendation.
Question:	What happened to the grid concept DelDOT was proposing?
Response:	We discovered that it could not be implemented as conceived because some of the properties that would be needed were already developed and any contributions by developers were only voluntary and could not be enforced. We believe the recommendations of this study will more than achieve the goals of the grid study.
Question:	Will there be a moratorium on development? Will politicians be prohibited from changing zoning?
Response:	A moratorium on development is not likely to happen in Sussex County. People who own property have a right to develop it according to current zoning. However, development with direct access to the parkway will be prohibited.
Question:	We are very concerned about safety. Could Representative Schwartzkopf get the Governor to declare a safety emergency in this area so something is done about it?
Response:	That should be discussed with Rep. Schwartzkopf.
Question:	Why don't we have highway advisory radio in Sussex County?
Response:	I can't answer that question; it's outside the scope of this study.
Comment:	The Traffic Management Center is understaffed.
Question:	When can we expect to see this controlled access parkway built? Will it take ten years?

Response: That is probably the right time frame. It still has to go through further project development, the environmental process (NEPA), and detailed engineering.

Question: How can you expect to solve this problem with only two interchanges? If you redesign Alternative #2 (Commercial Arterial Concept) and provide three or four more overpasses for through lanes and use the 140-foot right-of-way for a total of ten lanes, you will see a significant change in the VMT/VHT results.

Response: We don't believe your suggestion would work within the very tight constraints of the study area. The locations of the three interchanges reflect industry standards for the minimum distance between interchanges in an urban area and the distances required to accommodate acceleration and deceleration lanes at the interchange and for the slip ramps.

State Route 1 Land Use/Transportation Study

C. Public Comment Log

Prepared For:
Delaware Department of Transportation

Prepared By:
DMJM+HARRIS
516 East State Street
Trenton, NJ 08609

SR 1 Land Use Transportation Study

Issues/Comment Log

People traveling to Bethany Beach clog SR 1. I believe a cross road from north of 5 Points/Rt 9/Nassau area to connect on 26 near Bethany would eliminate much of the tourist-season hassle (& open more business opportunities-real estate west of SR 1, etc.).
Bypass routes must be devised to lessen traffic on business Rt 1. Route could begin just south of Milford & continue to south of Rehoboth Beach, running parallel to and west of Rt 1. Toll charges would reduce cost of new construction. Also, use of a trolley from 5 Points to Rehoboth Beach would be helpful. This would necessitate a large parking facility near 5 Points.
Please consider light rail as an alternative means of transit to increase mobility & reduce highway congestion
Widen SR 24 & put a connector route through to SR 1 around Red Mill Pond. Cross US 9 between SR 5 & US 9 & SR 1 junction. Will take local traffic off SR 1 between SR 24 & US 9 & SR 1.
I would prefer seeing an entire transportation system update along SR 1. Remove the median strip, do limited access throughway 2 lanes north and 2 lanes south with service roads on each side and jug handles @ 24 and 9. Eliminate sidewalks. This is a farce to assert multi-modal usage. It's a fallacy!
summary of letter - main categories of population growth: retirees, second homes, vacationers, people providing services to the other groups. Can't be limited. Placing restrictions on development won't work either - developers will go elsewhere & people will still use SR 1 for shopping, getting to beaches, boardwalk, parks. Agrees with third lane addition, but it is short term, stopgap. Need a limited access highway to the resorts. Should start somewhere north of Nassau. Exits limited to either Savannah or Georgetown Rd, depending on route, possibly King's Highway, Route 24, Rehoboth Beach & Dewey
summary of letter - village concept won't have sign. impact on traffic. Retired people don't need dry cleaners, deli, etc. Businesses wouldn't be profitable. Most shopping trips to supermarkets, Wal-mart, home depot, etc. Need a limited bypass like Dover's. New taxpayers are coming and not burdening schools - should be source for highway funding. Need sufficient funding to do prelim eng. and protect land against development
How about frontage lanes for outlets on Rt 1 and separate express lanes like Palatine Road in northern Illinois
It is high time to expedite the planning and start construction on SR 1 before it becomes impossible. Routes 9 (Georgetown to 5 Points) & 24 (SR 1 to Millsboro) should be made 4-lane limited access highways ASAP. Do something to relieve congestion at Rehoboth entrance.
Field Lane, where I live, is just off Rt 270A at the curve. It also parallels SR 1 but ends in the woods. I wonder if extending Field Lane is a feasibility - has it been considered as a service road to connect to the Glade Road?
I'm SO disappointed the idea of rail service from points north down to the beach has been shot down! Of all the plans for the future control and management of traffic, a rail line (or 2) is surely the most farsighted and practical (albeit expensive) solution. It can be done! It would benefit everyone
Please consider the possibility of creating a limited access bypass around Lewes-Rehoboth Beach & Dewey Beach. This would divert thru traffic to
SR 1 aside, how about getting going on E-W routes - toll roads even to Fenwick Island, MD - could be demanded by DelDOT for Anderson to build. Rts 16, 9, 24 & 26 need to avoid the town & overpasses over 113, 13 & railroad tracks
Submitted article on hydrogen-powered fuel cells
The state needs to act quickly to build a multi-lane limited access highway west of SR 1 to carry through traffic, build a connecting east-west limited access highway, build overpasses to roads that intersect SR 1, especially an overhead way for traffic going into Rehoboth Beach, and overhead pedestrian
Primary objective, based on comments at meeting, should be to preserve (improve) peak transportation for local residents on local roads. This was evidenced by comments at meeting about 5 Points overpass, Plantations residents' difficulties "getting out," analogies to Cape May, etc. The fear is that significant improvement on local roads will draw resort traffic and this is not desirable to locals.
Print on furnished map is so small can't tell what being proposed. Where is Rt 24? Where is existing Plantations East or West? Why not clarify?
Residents of Camelot could walk over to K-mart if there was a pedestrian crossing over SR 1. Current traffic arrangements force residents to drive just to
summary of letter: increasing problem with pedestrians and cyclists trying to cross SR 1 in Rehoboth Beach area - lights timed for vehicles and no pedestrian crossings. If something is not done soon to accommodate people on foot and bicycles, it is clear deaths of individuals may result.

Widening southbound SR 1 is like widening the fat end of a funnel without widening the narrow end (Rehoboth Avenue turn off of SR 1). The cause of the backup on SR 1 N into Dewey and beyond is the traffic light on SR 1 S Rehoboth Ave. The map is great except I can't read it without a magnifying glass.
Work during evening or all night using flood lighting to avoid congestion on Route 1 and to bring the work to completion quicker. Develop alternate route
This is a very helpful & informative newsletter. Thank you! An improved Rehoboth Avenue intersection - with access under the bridge from southbound SR 1 - seems to me to be the most critical issue.
It is a difficult situation (SR 1) but there should also be another way to get to the beach than Rehoboth Ave. and from the Dewey side.
Thanks for getting these vital studies off the drawing board & moving.
Totally inadequate plan. Take a look at MD's solution to solving the gridlock problem at Bay Bridge. Build a route from Dover to Fenwick - bridge over the bay - take the traffic bound for Ocean City off SR 1 - look to the future - your plan may help some in some areas- NO HELP FOR THE GRIDLOCK OVER CANAL BRIDGE - take a look at the situation when in rains - COME ON! DELAWARE CAN DO BETTER!
Great newsletter and very interesting PAC.
Bike lanes on the shoulder of Route 1 are an invitation to carnage. Safe use of bicycles should be encouraged to reduce pollution, noise and congestion, such as dedicated bike routes on which low-speed local traffic only is permitted.
It's real simple. 4 lanes elevated from Nassau Bridge to South Dewey, 1 exit at Midway & 1 exit at Rehoboth
A total moratorium on any new building permits in eastern Sussex County for 1 year starting NOW. Except emergency, health, safety & education facilities. This was done in Carroll County, MD, in the late 80s and worked.
You already have the right-of-way for a new 4-lane road from Nassau to the state seashore below Dewey. Build an elevated 4-lane overtop the present Rt. 1. Think about it. Put up billboards Towns Full GO HOME.
Make SR 1 a highway with exits for local access. Stop upzoning until roads can be improved. Do Sussex County Planning & Zoning & DelDOT see a correlation between horrendous traffic & continued development?
In addition to the new grid system & new third lane for route 1, consider a new limited access highway leaving SR 1 near SR 5 which reconnects with SR 1 somewhere south of Dewey Beach. Rehoboth & Dewey Beach traffic would then enter from the south.
I'm a downtown business owner. I believe commuting by bicycle is the most common sense thing we can do to alleviate summer traffic. But it's not safe. We need independent walkways behind the outlets and stores connecting to downtown. I would like to ride on SR 1 more in the fall and winter, but when
1) Elevated highway beginning at the crest of the Nassau Bridge and continuing to below Dewey Beach for thru traffic. 2) at least one daily morning bus from Rehoboth Beach area to points in Wilmington, such as train station, Hotel DuPont, and Christiana Mall - and one return bus in the evening. 3) Shoulders for all roads, so that the entire system can serve bicycles, walkers, and other users, besides motor vehicles. 4) Reestablish rail service and add rail service to connect Wilmington to Ocean City, MD (if possible), with stops at points between.
Option 1 sadly displaces a number of fixed-income retirees. Traffic volume includes vehicles destined for Fenwick and south where a more southerly by-pass seems a likely alternative. If this plan's proposed options are viable, why was a permit given for my house and those still being built?
In Rehoboth plans for the future include a "roundabout." Before this is constructed, I would suggest looking at the roundabout constructed at Clearwater Beach, FL. It has become a big mistake, causing accidents & increased traffic tie-ups.
We feel the PAC will do a good job representing the best interests of all the year-round residents.
I would think that more thought should be given to widening the roads instead of the plans published in this brochure. It's not the residents but the influx of tourists that has to be speeded up. Why should permanent residents be held in their little developments while the tourist gets the benefit of the shopping
Along with another way past Rehoboth, how about improving the bridge from Dewey to Rehoboth. It's constantly gridlocked on the only other way out of Rehoboth. We're tired of sitting and burning precious gas just so the tourists can go to the malls and outlets.

I would like to know what's being done to alleviate the problem of SR 1 through the Lewes-Rehoboth area. What used to take me 11-14 minutes in the summer is now 30-40 minutes. Also, what about the entrance to & from Rehoboth? A major fire on that street could cripple the whole town.
Consider mass transit from Rehoboth/Lewes to Dover for workers. Limit residential development based on infrastructure & WATER limits!!
Every major city has adopted this method plus. We have become a major city. I have before suggested a raised road over one from X miles north to Fenwick. You keep trying to do the impossible environmentally thru swamp and non-habitated is foolish. Environment and crowded mess is a factor plus I am sure you know you will need maybe 2 more lanes on 24 and most assuredly turn off lanes to developments. PS: raised highway could be toll people
I still say the solution from 5 Points to Rehoboth and onto shore. A raised highway from 5 Points to and through Rehoboth would be a toll road. A circle at Rehoboth entrance is a disaster. A raised highway should have a high speed toll thus One would be less congested and dangerous for shopping.
As very active bikers: any design improvements in bike routes (safer). It is currently scary going into Lewes &/or Rehoboth. Encourage bike use, especially for seniors - can relieve some auto traffic (even tourists - maybe an incentive to do it - get out of your car, bike & smell the fresh roses and air, hear the birds). Henlopen park bike trail is neat. Thanks for doing good work.
Consider better roads and curb all future massive development.
The grid is a pretty good idea
Sounds great if it can be made to work. We sold our home in Bay Vista four years ago because it was not fun to be there any more. Because of traffic, roads, parking at the beaches. Enough was enough.
More public transportation, outlying parking with shuttles to beach & outlets every 15 minutes.
Anything you can do to involve local planning commissions would be appreciated. A suggestion: A workshop for local planning commissioners.
Eliminate sidewalks - make deceleration lanes as long as possible. Use 11' lanes anywhere necessary to minimize impacts on businesses. Move Home Depot entrance to light. Put Lowes entrance on SR 1.
Studies and resulting recommendations go at a necessarily methodical pace. Meanwhile, commercial and residential building is streaming through eastern Sussex County. Time tables for the study and interim building controls must be established <u>immediately</u> or there will be no land to make plans for.
We are happy to read that something is going to be done about SR 1 traffic so that we can get to the stores during the summer.
I live on Airport Rd and am considering a half-round drive in lieu of lawn in my front yard. It is too dangerous to back out of my existing driveway. . . .Would you consider some safety measures such as 1) a 25 mph limit with <u>lots</u> of signs, 2) allowing residents to relocate mailboxes (postmaster is not available to talk to me), 3) maybe making Airport Rd one way from Food Lion to Old Landing Rd, 4) eliminating large trucks unless they are making a
Stop or greatly reduce commercial development, i.e., additional housing units, from being built because your activity centers only try to restrict people's
I have a suggestion that I believe so be ?? Some possible thought in one way that would ease so much congestion - traffic on Rt 1 simple solution - a service road on each side of highway. They did this in Solomon's Island, MD, because of high volume traffic and believe me it has solved so many traffic problems - it should have been done years ago. Eliminate some long traffic lights.
All these things look great but you're taking much too long to get them done!!! (max of 3 years) 2006, need additional 5 yr, 10 yr, & 25 yr. plan in the works! Your 18,000 new homes by 2025 is short, expect 30 to 35,000.
Need to put $.35 tolls in several locations.
Better roads and charge tolls like New Jersey does on the Garden State Parkway. Charging tolls would rotate traffic to Rt. 50 and Rt. 113 going to Ocean
It seems the horse has left the barn.
Create limited bypass toll lanes (similar to HOV lanes) from 5 Points to the canal with the toll collected by E-ZPass and no cash toll allowed. This will get through traffic through and off the service road to the malls which is what SR 1 has become
Unsatisfactory meeting - no info, no datelines, no costs. No relief this year after 2 yr study!

Consider overpasses at major road intersections, i.e., Five Points, Postal Road, Rt 24, Rehoboth Ave., etc., rather than widening Rt. 275. Allow local travelers easier access as well as enhancing travel on Rt 1. The Public Advisory Committee is not represented by Health or Education officials - much needed resources. This was successful in Queen Anne's Co., MD, on Rt. 50 on Kent Island. Also circles at major intersections facilitate travel on access
Slow the building! We need water filtration plants & sewage disposal plants. Thanks for doing a good job.
Slow it down. We need new sewer treatment plants. We need water filtration plants. Thanks for trying to fix things.
Access roads were addressed approx. 10-15 years ago. Now hindsight would suggest "shoulda done it"! Is there any possibility this can be looked at again? I work full-time doing home health nursing throughout the entire county. Traffic from Route 1 to 13 is impacted every day 10 months of the year!
(fire chief) A large portion of the impact area falls within the fire district of the Lewes Fire Dept. Both sides of this study greatly impact the growth & operations of the Lewes Fire Dept. We must be asked for input during each step of the study. We will continue to follow the study at all meetings and send literature; however, our opinions must be seriously considered. Just remember, most people only have to drive on these roads, we have to respond.
The proposed concrete area at the end of Marsh Road at SR 1 should be flattened so emergency vehicles may still cross SR 1 to access Shady Road. This is the primary emergency vehicle route to access CR 275 in the area of the Plantations or CR 277 to access Gosling Creek/Morning View area. The center lane both north- and southbound should be designated as the emergency vehicle lane.
Summary of let. also signed by Anthony Freeman, Michael McCoy: Please consider a limited access road east of SR 1 between Kings Highway and Rehoboth using part of the old railroad bed into Rehoboth. Other detailed suggestions about problem areas sent to Secretary and forwarded to project
We sincerely hope help is on the way!
Would like to see continued expansion of bike and pedestrian lanes and some sort of transportation from the bars of Dewey and Rehoboth to eliminate the
Build a second two to three lane bridge into Rehoboth. Build a multi-level parking garage close to the boardwalk. Secondary roads to feed the outlets. Build a 2 lane monorail straight down Rehoboth Ave. to the existing parking facility on 1.
The sidewalks are dangerous. Terrible backup on U turn by Mobil station if left turn at Diver is taken out and all southbound U turns are combined with Home Depot northbound exiting customers.
Basically I just wanted to highlight the development of the park-and-ride which is proposed north of Five Points. Please consider purchasing the property that is adjacent to the railroad line (the proposed * on the 1998 Grid Study Map). Also with the p&r, make multiple access roads and give transit on/off priorities to make it more efficient getting back out onto the route.
By closing the crossover lanes on Rt 1 (and also Rt 113) DelDOT has made it impossible to get to secondary roads to avoid the congestion of major highways. Give us our access crossovers back so we can get to the secondary roads you want us to use.
The PAC seems to be an excellent way to help address the SR 1 Land Use/Transportation Study. The public information meetings are most welcome and the chance for ideas to be presented is exceptional. Keep up the good work!
I have received & read your newsletter. With all the people on the PAC it seems that you are on the right track. After all the planning is done take action
Timing of the stop lights could aid in the flow of traffic, i.e., less "stop 'n go" - more fluidity to the pattern.
Rental properties are an issue because they have the same check-in/check-out times and days. We should try staggered times and days to eliminate having all those cars on the road at once.
The signage should be changed into downtown Rehoboth. People on 1A should be encouraged to use 1B.
Rt. 9 to Rt. 275 - should have turning lanes so traffic going right will be separated from traffic going straight.
The area of the study is too limited. It should extend at least to Rt. 88 and all roads off of 88 connecting with Rt. 9. Mailing should include Milton PO because many developments near Lewes are in Milton PO. Set up an e-mail list for information. Include us on Rt. 24 study also.

I no longer visit Rehoboth! Another lane on SR 1 will not increase parking in that town. I would love for the bus to come to our park entrance & other parks & developments where concentrated housing is.
Route 1B from Highway 1 to Rehoboth Ave. should be addressed under this plan. Something has to be done to prevent traffic speeding up and down Route 1B (State Road) which is a residential neighborhood. It is common to see cars going up to 50 miles an hour in a 25 mph speed zone.
A bridge from Long Neck Road over the bay to Dewey Beach is a proper move. (Ocean City is a model.)
Consider bike trails & walking paths along major roads, esp. 24, SR 1, 275. I believe folks would bike & walk if they had a safe road. Right now none are
Widen Beaver Dam Road (23 south). Run sidewalks throughout Belltown. Reduce speed in Belltown and Beaver Dam Road.
Enclosed map showing alternate routes. If you must stay on the old highway, make 8-lane elevated Chinese wall structure (over top of current highway) to get traffic moving; build new bridges across Rehoboth Bay. Make all cross streets priority to get onto Highway 1.
A way to get out of Rehoboth and go south without going north first would be a great help. How about bringing traffic out to the existing light at Bay Vista and allowing south turns and cross traffic?
Finally someone is paying attention. Let's hope it's not too late.
For Rt. 1 and Dartmouth Drive. Traffic backs on Dartmouth to get on Rt. 1. Currently a turn lane south and a lane for straight combined with turn north. Suggest - widen Dartmouth to A) turn south, B) straight through, C) turn north. Currently backup turning north - people wanting to go straight also waiting. Would double traffic able to move other than south from that intersection.
The traffic on SR 1 is so overloaded; the need for improvement will worsen dramatically by the time the planned work is done. We need relief NOW!
Summary of letter: Our quality of life has been threatened & put on the back burner & this is absurd. Growth zones should be developed as zoned without greedy developers exploiting areas without any consideration for the already congested traffic on Highway One. This road cannot handle the traffic now...what miracles are you expecting that will allow even more traffic? Paragraph on difficulty during the summer. Paragraph on all the development since 1997. Keep the density "as zoned" and don't compromise infrastructure which reduces our quality of life and makes for havoc on the highways.
The circle will be a traffic disaster. Build an elevated ramp from Rt. 1 south to Rehoboth Ave. and from Rehoboth Ave. outbound to Rt. 1 south heading to Dewey Beach. Replace the Bailey Bridge on Rehoboth Ave. west and leave it there **permanently.**
You need to direct the traffic to its destination. There is not an interstate highway in Sussex. All traffic coming into this part of the state is stuck on a two-lane rd with red lights and merging traffic. SR 1 from Lewes to Dover is very dangerous. I travel this portion of rd every day and I've seen it all. We need to direct traffic away, over, under from the SR 1 corridor. We need a new interstate highway with limited access so traffic is diverted to its destination and
The activity centers idea is fine and will be great in the future. However, there is a desperate need of lowering speed limit on Plantation Road or installing lights or both to avoid catastrophe. It **is** residential!
summary of letter: study must assess cumulative impacts and must include: 1) review of existing Grand Slam & Home Depot entrances; 2) Road 276; 3) Plantations Road, 4) Five Points intersection in terms of new development, 5) Wescoats Corner (realignment of Orchard Drive), 6) Road 12 in terms of
Eliminate all but two traffic lights in Dewey and some on SR 1 north. Build overhead people crossovers in Dewey and by the outlets. Put in a ramp, bridge, whatever at the intersection of SR 1 and entrance to Rehoboth Ave. No circles; this will still jam up with traffic.
My office is in Olde Town Office Park. I see a lot of traffic delays getting off Kings Highway at the old Lowes to get onto Rt. 1, esp. when the ferry gets off. The traffic backs up past Clay Rd. It is bad PR for the ferry & for the county. The light needs to be longer - it only lets 10 cars through in summer.
Use computer light timing to regulate flow on Rt 1.
summary of long email: Was responsible for improving intersection northbound at Kings Highway and Dartmouth Road, but southbound traffic is still very bad. Thinks an overpass at 5 Points won't help if the traffic is backed up through the light to Mill Pond Acres (although it will stop the accidents). Need to upgrade the narrow, shoulderless roads in the county in the more rural areas.

PAC has 3 mayors - please include mayor of Lewes. Please include consideration for motorized scooters, bikes, etc. (Lewes is represented by Mayor's
How about stopping all auto traffic into the 1st block of Rehoboth Avenue? Foot traffic only!
It is embarrassingly late in planning. With the introduction of all the outlets as well as retiring persons, it all should have been anticipated. Bicycle & pedestrian lanes are fine, but the major problem is automobile traffic on SR 1.
We need an overhead road running parallel to SR 1. Ocean City people could go right on. Rehoboth visitors could use the road that exists with access ramps. You're putting money into bicycle routes & sidewalks when it's the cars that are the problem. The others are fine - look great but it's the cars that are the problem. Heavier traffic every year. I know this takes money which we probably don't have. One more lane 5 Points - 24 will help but will also increase how many more cars come this way instead of 113. We need another road of some sort either parallel or overhead.
Looks like more parking lots & bike paths than new roads which will help alleviate congestion on SR 1. I am very skeptical that bus/public transportation will have <u>any</u> helpful effect. I've worked in traffic engineering & community safety/emergency management for 15 years.
I suggest the use of service roadways on either side of Rt 1, with fewer signals & crossing points across Rt 1, to remove pressure of retail store traffic from the through traffic. I also think a continuation of Rd 275 (Plantations Rd) south of Rt 1A would help.
Strongly favor economic incentives for open spaces. Strongly support new/future development paying all economic costs of their impacts. We are killing the goose that lays the golden egg. Thank you.
Controlled access roadway is moving in correct direction, i.e., separate through traffic, but the plan does nothing to fix the backup caused by the area south of Rehoboth & Lewes canal through south end of Dewey Beach.
I can see where your ideas are coming from, but you're not addressing the major problem - getting to these communities and leaving them. Until the roadways and traffic are resolved, it won't matter if you live in a community development or a country lane. We will still have to go to work, travel ourselves and deal with tourist traffic. That needs to be addressed first and foremost.
I think we need an overpass at 5 Points. It may save a lot of accidents; also an overpass where you turn to go into Rehoboth. Florida has overpasses everywhere and it keeps traffic moving.
I am not sure 3 lanes from 5 Points to Rt. 24 will be that much help. The traffic back-up going southbound is from the lights at the outlet intersections. Northbound backup on Saturdays when renters are checking out is caused by the Rehoboth crossover and, again, the outlets. Vehicles southbound could use Exit B, not many know about it, for access to Rehoboth Ave.
I want nothing to do with any Sussex County "Grid Concept," now or in the future. This is a negative issue in my household and our development. Better come up with better terminology for starters.
Scenario #1 almost exists at the present time! This summer it has regularly taken us 40 minutes to go 2 miles. Plantation Rd has had 1/2 mile or better backups. DelDOT wants it to be an alternative to SR 1 (that's a joke!) Development along SR 1 corridor has to STOP!!!! We already have a nightmare.
Summary of letter to News Journal: Felt like a prisoner in her home Wed. - Sat. because of increased traffic caused by excessive development in Long
There should be all property in the state seized by same and state housing and planning should be adjusted to fit everyone's needs. There will be no state to state travel without proper passport. This will curtail the amount of unnecessary travel.
Your plans will be obsolete before they are completed!! There must be an end to building (new construction) on SR 1! Your plan does nothing to help residents who live east of SR 1. A road that runs from Rt 9 to Gull Neck Road parallel to SR 1 & ends at West Rehoboth would be very helpful. There are at least 500 homes scheduled to be built east of SR 1, between Rt 9 and 24. The building has to be stopped until the roads & infrastructure catch up.
I think access roads would help alleviate congestion for people traveling to downtown Rehoboth or farther south; they could stay on the highway and others
Our priority is restructuring the Five Points area. There is too much development and constant congestion. When all the building is done, we will look like

Remarks: The Advisory Committee has 5 out of 33 or 35 members which are citizens. This seems about right if these people have lived here long enough to understand the growth problem. It is not clear whether DelDOT has a member on the PAC or not. The builders and developers do not seem to be well represented either. I have marked your map with a suggested secondary routing of Rt 1 traffic which avoids 11 traffic signals and eliminates these unsafe traffic areas. As a tradeoff, two large and two small overpasses would be required; one of which is the 5 Points intersection. The other overpass would be at the entrance of Rehoboth which eliminates the need for a circle going into the city. Note that the proposed developing land use sites are not
It is obvious to all that we need a bypass now. All other proposals are designed to obfuscate this fact, to preserve the business interests of small town entrepreneurs as well as larger corporations on SR 1. When is DelDOT going to do the right thing?
Need bicycle and pedestrian crosswalks and pedestrian lights to cross SR 1. By adding more lanes, you only provide more stacking area for gridlock. Limitations are driven by destinations not lanes. Need to add service lanes to all alternatives.
1. Parallel road to SR 1 - make them more accommodating & well publicized - They will also have to be widened to accept increased volume. 2. Build or allow the construction of in/out roads or lanes to access the hotels, motels, subdivisions, shopping centers, businesses. Perhaps this could be done by the future businesses. 3. Build service roads adjacent to SR 1 that allow people access to businesses, etc., without causing a back-up on the main road. 4. Consider constructing bridges off such roads as the Ferry Route 9 and 5 Points. 5. Consider using jughandles with long egress or access at major roads. 6. An evacuation plan is necessary. 7. Roads like Routes 24, 9/404, Ferry 9, etc., will have to be widened. It appears the access lanes in the middle of SR 1 favor the shopping centers. Remove these barriers. Use jughandles at the nearest intersection. 8. Provide more buses. 9. Completely remove any
From Rt 1 onto Rt 9 and then to get to Lowes is a mess. Traffic backs up and people not knowing which lane they should be in.
Summary of email: A network of major collector roads is badly needed in eastern Sussex County, including SR 24 from Millsboro to SR 1, US 9 from Georgetown to Five Points, SR 5 from SR 1 to SR 24, and SR 23 from Five Points to SR 5. DelDOT should obtain the right-of-way now. Detailed
The meetings are good, questions & exchange good BUT!! Please get a portable PA system, repeat the questions or offer a microphone. Why wasn't your traffic signal light expert here for this meeting. Do it next time.
Overpass from Nassau south to below Dewey Beach.
Upgrade Rd 275 (3 lanes south & 3 lanes north) from 5 Corners to Rd 274. From Rd 274 purchase & obtain right-of-ways to build 6 new lanes to the
Tinkering with Route 1 will not solve any problems. Route 113 as an alternative route is viable. More economical approach is to build bypasses or overpasses on 113 around/over towns like Georgetown, Milford, Millsboro, etc. Must have proper signage where 1 and 113 diverge. Need to take a destination survey at traffic lights
Having recently relocated from central NJ, we can see the problems you & I will be experiencing soon. The main thing is go slow with expansion. We ran out of roadway in central NJ. It can happen here also. Go slow! Too many stores Home Depot, strip malls, etc. Soon 40-50 story condos will be built
Add a lane to north and south on Rt 1. Increase speed limit to 65 for the entire length. Restore the Route 1 speed limit to 45 mph all through Rehoboth. Let's keep traffic moving and not slow it down.
DelDOT should focus on limiting development in Sussex County (possibly by making the county responsible for new/improved roads?) instead of making new roads which will be overcrowded upon completion. Left turn onto Bay Vista was a big mistake - make access to the underpass 2-way and eliminate the light altogether. As a short-term solution to entering Rehoboth, try re-signing the highway to divert traffic to state road.
We own property between Rt 9 and Rt 24 and are interested in being kept informed of changes in traffic patterns in this area.
Perhaps an overpass at the SR 1 & Rehoboth Ave. intersection to cross the northbound traffic on SR 1 & decrease congestion on SR 1 south, left lane for people trying to reach the beach. Overpass for pedestrians (over SR 1) between Outlet Center 2 & 3. Before a tragedy happens! Thanks for wanting our
The grid plan will cause people to be trapped in their communities on weekends. The 3rd southbound lane of Rt 1 from Rt 9 to Rt 24 is desperately needed. AR-1 zoning should include smaller lot sizes with central water and sewer but density should remain the same, i.e.., 50-acre buildable

Stop! Just stop approving more and more development on Rt. 1! Reduce the speed limit on Rt. 1 from Rt. 15 south through Dewey to 35 mph (year round) plant trees and landscape Rt. 1; make it an attractive avenue - cars going 50-55 mph along a road, with a place to pull in or out of every 20-30
We need an inner road for pass through traffic heading south. We need 3 lanes N and S bound. We need a better way into Rehoboth Township. And most importantly, slow or stop the building on SR 1.
Put a bridge on SR 1 at the Rehoboth entrance so traffic going north goes over the bridge & Rehoboth traffic goes under the bridge into Rehoboth. North traffic doesn't stop, Rehoboth traffic doesn't stop
Make SR 1 three lanes starting at the southern end of the bridge (Nassau). Lower the speed limit somewhere north of the bridge to 45 mph. Look into putting a road along the rail tracks under the bridge for people crossing SR 1 at Nassau; with one train a week it would present no problem to the railroad
Connect all parking lots - like K-Mart lot to Giant parking lot. Bridge north 1 at Rehoboth entrance. Traffic on Potal going to Route 1 the light only lets 4 or
Put up big flashing signs where Rts. 1 & 113 split just north of Milford directing traffic for all beach destinations below Dewey to take Rt. 113 south. Development in this areas is a chaotic mess. Experts in development say growth is out of control, rampant and destructive to the intended way of life. There is far too much linkage, influence and indeed membership in the Sussex County Council and the Planning and Zoning Commission.
You are doing wonderful work. This area has already been ruined by greedy commercial development. The activity centers and transfer of development rights appear sound. We had better use them. The trouble in Sussex County was that the majority of the county council and Planning and Zoning Commissions were involved in development and real estate. Talk about the fox guarding the hen house.
To relieve the traffic problem caused by the traffic light at the intersection of SR 1 and DE 1A (Rehoboth Ave.), I propose the left-hand turn lane from 1 to 1A be changed from a ground-level roadway to a gradually rising overhead roadway, an overpass.
Add service roads (as at Ames) to all outlets. This will keep shoppers off SR 1. This will free up SR 1 for beach goers & Rehoboth Avenue destinations.
Our family has lived here for approx. 25 years and it has grown leaps and bounds w/o concern for impact not only on roadways but on our inland bays. I do not feel that activity centers will reduce traffic. They still have to drive on Rt. 1 and they still have to use our facilities. We need improved road conditions and public sewer and water before any other building is even planned. People come here for the beach - not shopping. We need infrastructure
The seniors in Lewes like the beauty & historical aspects that could be ruined by too much building & traffic. SR 1 definitely needs some help.
Your project pipeline is too slow - your intersection radiuses are too tight for large trucks and fire vehicles. Project "4" should be up now. Plans are in positive direction. Thanks for the newsletter.
I think people should go around the Senior Center and talk about their plans for land use and transportation. We have lots of seniors down here. Call Huling Cove - 645-9239 or me 645-1505
Why have you waited so long to plan. It's a disgrace!! Send the group to Hilton Head to see how they planned ahead. The signs along the highway are terrible. I have had a house here for 50 years.
Something must be done to provide a bicycle/pedestrian path or shoulder on Gills Neck Road to accommodate the development occurring there. They're repaving now and it would be an ideal time to quickly implement the improvement, as it is, it is extremely dangerous.
The SR 1/Rehoboth Avenue intersection is the absolute key to easing the traffic flow problem. Bring in the top traffic engineering firm in the country & get them involved in this project. It would be money well spent.
I believe that the grass median strip should be used to create another lane. It is usually filled with trash and unkempt so I believe pavement shall best serve traffic flow and road maintenance.
Old Postal Lane is in poor repair & currently used by buses as well as through traffic southbound to avoid light delay on new Postal Lane. Please consider this accident waiting to happen.
Something needs to be done to correct the issues on Postal Lane and Old Postal Lane caused by buses using Old Postal Lane and ignoring cars.

Huge signs in Milford (where you get on Rt. 1) telling people going to Bethany, Fenwick, Ocean City to use 113; get them off Rt 1. Toll on bridge at Indian River to set up cost acct./or help defray drivers to come through Rt. 1
On Highway 1, next to the Outback Steakhouse, is the Rehoboth emergency fire alarm. Please extend the sidewalk system to go in front of it.
All red/green lights on SR 1 should turn the same color at the same time (like Ocean City). A bike path between Lewes & Rehoboth through old railroad
Follow up on the bike path between Lewes and Rehoboth using the old railroad path or state park lands.
Overpass @ SR 1 & IA Rehoboth Ave. Secondary road to relieve the ? pressure Barrall Road. Plan road activity first - then growth patterns of residential & commercial businesses. How to reduce or eliminate commercial ? traffic
Have at least two crosswalks constructed across Rt 1 for pedestrian traffic. Near Rt 1 outlets.
summary of letter: Residents don't need a parkway; they have adapted. Two of the eastern options for the parkway would greatly impact their quality of life. Tourists can just wait like the residents already do.
Internet posting a good idea. I think most studies last too long.
We would like to wait to see what the transportation study has planned.
Please include Rolling Meadows Homeowners Association in presentations
Resetting the lights has not helped the cross traffic on SR 1. There need to be overpasses or something so us locals can get from one side to the other. The traffic going north & south blocks the intersections causing gridlock
Summary of letter - intersection of Rt 283, Plantations Road (Alt. 1) and Postal Lane the most dangerous in Sussex County. SC has irresponsibly granted entrance permits from Alt. 1 to Lowes, made Postal Lane a major entry to Super Fresh mall, granted entry to Aydelotte Estates without considering hazardous intersection. Traffic signal absolutely required at intersection of Postal Lane, Plantations Rd and Cedar Grove Rd. Then says signal could only
The biggest & most immediate improvement to the traffic problem would be redirecting the Bethany Beach, Fenwick Island & Ocean City traffic onto Route 113 at Milford. Route 113 is more direct for them & all it needs is a large sign.
My major concern is roads/traffic on Route 1 in Rehoboth. I live off Bay Vista Road and gaining access to Route 1 north is a nightmare in the summertime. The light takes forever. I know this is one problem but there has to be others and the whole mess needs a grand plan to solve the huge problem. Also, further housing developments should be stopped until problem is solved.
We exit from Aydelotte Estates on Plantation Road. Although we are newcomers to the area we recognize that Rt. 1 traffic with destinations further south than Lewes and Rehoboth will benefit from a bypass as will travelers with destinations of Lewes and Rehoboth. Safer and more expeditious travel will
Please do all of this ASAP.
Steps should be taken to expedite thru traffic transiting the 5 Points to Dewey section of SR 1 both north & south. Separate the local traffic & allow thru traffic to move at a rapid pace & the congestion will disappear
At the 5 Points area where the Lowes shopping center is, they should have built an overpass instead of all those lights.
They should have built overpasses where Five Points comes together.
DelDOT needs to minimize or eliminate backups on SR 1 north of 5 Points - this a major hassle to all who live north of Red Mill due to lack of alternate
At Lowes, make the Route 23 to 5 to Massey's Landing. Build bridge over below the Indian River Inlet Bridge. Make the Indian River Inlet Bridge a toll in both directions. This serves 2 things - relieves Rt 1 and Rt 24 going south. Charging will keep traffic from going on 23 then up to Dewey, etc., over Inlet bridge. User is paying - paying for our new highway, etc. Charge for new bridge also. Please we need relief!! NOW!!
A practical local rail system for local residents and a long distance rail system connected to Wash., DC, and Wilmington which would include Philadelphia, Baltimore and actually also Washington. Satellite parking isn't sufficient for visitors nor does it solve the problem.
It's a few years late. Now we have a development on antiquated old farm roads which has led to potential hazardous conditions. But it is better late than

Please clarify the location of the proposed alternate north/south road west of SR 1 near Gosling Creek Purchase. Email response indicated exact details are unknown at this stage in the project.
Route 24 should be widened between Routes 1 and 5; SR 1 should have the third land added between 5 Points & Route 24 ASAP; a left-turn arrow should be installed for traffic heading west (from Lewes) on Savannah Rd, turning on to SR 1.
More planning, less zoning. Less building = less traffic
I especially support the pedestrian/biking provisions.
I own the farm Dreamacres located at Postal Lane and Cedar Grove. I would like to discuss with the appropriate person the two alternatives for realizing the intersection and how they will affect my property. (discussed with Project Manager)
As long as Planning & Zoning and County Council are allowed to have a rubber stamp approval attitude for building on Rt 1 there will always be problems.
The more roads you provide, the more cars you will have. The solution is a fast-moving electric car with plenty of stops. The longer we put it off the more it will cost. We use them in Europe why not home. Both local and long distance bus service needs to be improved. The present drop off point, in RB, for
Great job. However, if the Cedar Grove realignment is not done, can you resurface Postal Lane and add shoulders and bike paths from 275 to SR 1?
Approximately 50% of vehicles continue down to southern towns/Ocean City. Solution: 4-lane highway west of Plantation over upper Rehoboth Bay via viaduct to merge below Dewey Beach and continue south on 1. Toll from Nassau to points south.
Grandfather in & keep the 1/2 acre zoning law in residential subdivisions that were zoned before public sewers were installed. <u>Do not</u> allow these lots to be divided. Install sewer & water lines & underground utilities before improving or building roads if possible
We have been listening to this baloney for 15 years from the same people. Do you really think people came here to stay in community centers? They came here to go to our beaches and use the ocean and bay. Buy the land and build some new roads before we all are walking to our destinations, we still need sewers and other infrastructure before all this building should take place; whether it is near the ocean or any place else in Sussex County.
Please consider an overpass from SR 1 at entrance to Rehoboth Beach. Use field now designated for unneeded visitors center. Do not use large parcel of land for strictly tourist info & entertainment. Flow of traffic would be greatly enhanced. Please consider!
Overpasses at 5 Points and Rehoboth entrance have been considered over the last ten years - why have they not been implemented?? Also, over road walkways at the outlets?? Moratorium on developments and commercial.
We do not understand why the traffic lights are not synchronized from 5 Points to and through Dewey (Ocean City can do it).
summary of long email: Lack of address signage on SR 1 causes drivers to change speeds as they look for the businesses they want. Businesses should be required to make their address numbers visible from SR 1 (suggestion passed along by Project Manager to Sussex County, Rehoboth/Dewey Beach
Move park-and-ride farther out to Nassau. Provide transit on weekends (fall through Christmas). Provide a shopping shuttle loop from Ames to Midway and back. Color code bus routes to simplify. Provide safe bike route between Lewes and Rehoboth.
Please make sure the study includes beautification of SR 1, with trees, flowers & removal of unsightly billboard signs! The sidewalks & bike trails are a great idea for this area - more green space for public parks & those tall cell phone towers should be moved or taken down so we don't see them.
Someone needs to put a rein on the planning & zoning committee. They need to stop being a rubber stamp committee. They have ruined Rt. 1.
They paved paradise and put up a parking lot. Route 1 is a parking lot. People that do not live here are deciding our future. No bike path, no way for
Need overpass at SR 1 & 9. Longer lights at side roads - Postal Lane. Direct more traffic to use 1B going into Rehoboth.
Five Points is the bottleneck. I feel an overpass would help alleviate back-ups. Also, light synchronization would move traffic beyond 5 Points. As it presently exists, one goes from one red light to the next.
State must address 5 Points for a metroform (like NC County). Solution - we need overpass & cloverleafs for Rts. 1, 9, 23?, 285, 269, 268A, etc. We cannot have 5 Points continue to be a bottleneck any longer as over 12-1500 homes are already planned for Savannah & Plantation roads

Entire Rt 1 continues to be a hazardous road. It is extremely dangerous and becoming difficult to travel.
History has shown that the more roads you build the more you increase traffic. Trends in metropolitan areas now is to discourage auto vehicles and look towards alternatives. Also am concerned that once a new road is built, developers would start developing along the corridor where the new road is,
We need a bypass/loop to go around resort towns. We need more year-round public transportation for folks in rural areas.
summary of letter: increase in bike riders "an accident waiting to happen." Workers must bike because they can't afford to live in town and don't have cars. Riding on existing shoulder dangerous because buses use shoulder lane, turning vehicles use shoulder lane for travel. Sidewalks not connected to allow for safe use. Drivers don't respect bikers use of the roads. Need a wide sidewalk north- and southbound on Rt 1 from the Rt 1A turn-off for
We need the Dover Bypass to extend down south past Rehoboth to the MD line. We need more direct transportation from Philadelphia/Baltimore to
Old Landing Road from Highway 1 to Bay will be impossible to access!!! What are your thoughts -
The study should be completed with 5-, 10-, & 20-year goals with demographic data projected for the same year goals. Attention must be given to evacuation of this area in case of an emergency; we seem to be concerned primarily with bringing folks into the area without thought about mass evacuation. Many communities with over 300 residences have been developed with one access road leading to state roads often flooded during storms.
Widen/add lanes to SR 1 from 5 Points to Route 24!!!
Wishful thinking!! Big time. This is short sighted and simplistic. Activity centers may be **small** part of a solution. But, in addition, you will have to plan in open space corridors and limit development to manageable amounts. It is foolish to think people will stay at their activity centers and not travel in the
Summary of letter to B. Geier (Project Manager): Short-term: Rts 283 & 277 have little traffic or development, but if they are possible alternatives to 24, work makes sense but should be done in conjunction with realignment of Cedar Grove Rd. Park-and-ride is hardly used and don't need another one. Intersection of Dartmouth Dr. & SR 1 needs much more fine tuning of traffic light. Other short-term proposals look good. Mid-term: SR 1 a very bad place for a bike lane. Lanes on shoulders of Plantations Road much better & proposed bike trail linking Lewes & Rehoboth. Third lane must be completed. Long-term: 5 Points is a mess, but do we really want a grade-separated diamond interchange? Need to see actual plan. Doesn't think other interchanges are needed. Need to buy right-of-way soon to control access on parkway. Location of bike lanes on the new road not good - 6 feet is too narrow &
Something must be done. Too bad more thought wasn't given to traffic before all the building was approved.
Please make the bike path from Rehoboth to Lewes a priority!!
It's about 15 years too late. Good luck. I think the Sussex County Planning and Zoning Board and DelDOT have ruined a most beautiful area.
"Limited" access parkway should really be limited and "controlled" - does that mean limited or will this become another road to develop? Please give us
New road improvements Rt. 1 to Pilottown Road.
Maybe an electronic sign on SR 1 near Milford before I. G. Burton suggesting taking Rt 113 to Ocean City with ETA for both SR 1 & 113. This may ease traffic on SR 1. If people are given est. times of arrival for both routes, some may choose Rt. 113 to Bethany, Ocean City, etc.
Keep things simple!
Another lane on SR 1 will be like a band-aid. For the long range if P&Z continues to promote development there will be need for another access road to Rehoboth Avenue from Nassau on Rt. 16. A nightmare has been created.
Gather data to guide your discussions. Know what % of cars going through 5 Points are going to Lewes, Midway, south on 24, RB, Dewey, beyond Dewey. Focus on real solutions. Bikeways are great, but won't impact southbound SR 1 traffic.
Signs at all intersections (especially Wawa-Rolling Meadows) that state: It's illegal to block the intersection. Other signs I feel are needed: slower traffic stay right, use turn signals, please allow entering traffic to merge. If possible - timing traffic lights (like DC, MD). Rt. 24 to Rt. 1 south should have right on red w/a merge lane - one lane only (Exxon exit will need a caution sign). Obviously, development has greatly outpaced the roads - the answer is obvious but making it a law is not. The solution will get more difficult the further out of hand it gets! Good luck!

2 suggestions: 1) develop Rt. 5 as an alternate bypass route with a bridge to Whites Neck, 2) develop CR 275 as a parallel to SR 1. Any future development or redevelopment along SR 1 in the Lewes-Rehoboth area should require service road provisions
4 suggestions (summary) - 1st erect a bridge and run Rt. 9 over Rt 1 and build cloverleaves to Rt 1 from Rt 9. 2) build a bypass from north of Five Points to south of 16/1 and run it south all the way down to Old Landing Road and possibly to north of the Indian River inlet bridge. Acquire land asap. 3) keep Plantations Road the way it is 4) scrap the idea of a 700-car P&R at 265/1. People won't use it.
Not in favor of park & ride at Nassau. Don't believe our visitors from out of state are going to unpack cars to use bus to Rehoboth, etc., & most of backed-up traffic on SR 1 is tourists here for week.
Public transit is the answer - how do you get people to use it?
I think the village idea is a solution for now, but too many people in one area (or condo type units) makes for trouble.
Get rid of service road coming out of Rehoboth, way too much space being underused. Keep better track of lights along SR 1. Have a branch of state police only patrol SR 1 between 5 Points & Dewey.
What is wrong with option #1? That seems to be the course we have been heading for the 19 years I have been here. Build a sewer and they will live around it. Why shouldn't farmers sell their land as their predecessors, are you going to make them millionaires ...and still keep the farm!
Another lane will not solve the SR 1 problem. More signs directing traffic to 113 before they get to 5 Points - better improved roads going to 113 from 1 at Milford; solve the Rehoboth exit from SR 1; eliminate all left turns on SR 1 from 5 Points to Rehoboth bridge except where you have a traffic signal. It is too dangerous. People take too many chances due to heavy traffic. One through lane going south - no exits.
Do not allow any more housing developments along Postal Lane and Rt. 1 from 5 Points to Dewey Beach. Place a traffic signal at Postal Lane and Rd 275. Place traffic light cameras at Rt. 1 and Rd 283, Rt 24 and Old Landing Road. Time traffic lights at the above intersections so local residents can
Instead of having 1 lane of traffic feeding from Rt 1 into Rehoboth Beach, change ??? to 2 lanes. In other words, eliminate the now useless left lane which is striped off for no reason. This would greatly relieve the ridiculous backup into Rehoboth Beach and to the boardwalk and decrease frustration.
The state of DE should take more control of land use & rezoning
Your goals are admirable, the immediate and short-term fixes are overdue, and the long-term plan will be way behind the curve, but you already know that. I am grateful attention is being paid to a very serious problem. Landscaping should be included in all aspects of the "fixes" as it does seem to have a
Put cameras at intersections to get red light runners and to get the idiots who block the intersections. Cross traffic cannot move when they have green light. Do away with the diamond on shoulder - let the state buses sit in traffic like the rest of us. The state made this mess. When the shoulder ends and becomes highway, the state buses (DART) don't yield or merge safety. The state buses are an accident waiting to happen.
Speed limit on SR 1 should be no higher than 40 mph in the Rehoboth, Lewes, Dewey and 5 Points area, and patrolled by police to save lives and reduce accidents as shoppers and others cross from one street to another.
Illumination of each intersection on SR 1 including Rt. 88, and reduce speed to 35 mph with cameras to photograph speeders, etc., and those who disregard driving rules and no passing zones. We wonder why SR 1 in Ocean City, MD, has no such speeding and haphazard drivers.
I like what I see in this latest "Connections."
Summary of letter to Sec. Hayward: "Redesigning ALT 2 to provide three or four more overpasses for thru lanes plus using the 140-foot right-of-way for ten total lanes and retesting using the same data should show a significant change in the VHT/VMT results." County has played a sign. role in creating problem through poor planning, including new strip mall south of Outlet No. 1 and crossover for Home Depot. Will stay involved.
There should be high-speed lanes and service roads. Right-turn traffic is too restricted.

The problem that is continuing to grow is the runaway development in the Rt 1 area WITHOUT the presence of necessary infrastructure. The state & county must start requiring infrastructure plans prior to development approval, otherwise all plans will simply be trying to play catch-up. The presentation was adequate (except for the county part). Next time please have enough handouts.
We live in Rolling Meadows. Our one way out is to Rt. 1. There are two building supply companies, a glass co., a tile co., a large furniture stores and a Wawa the traffic from which must use Dartmouth Drive to exit onto Rt. 1. The green light allows 3 to 6 cars to go. If there are trucks, we may have to sit
Get rid of the nearsighted people who granted building permits on SR 1 near Rehoboth Beach. Improve Sussex County zoning.
As a former consultant for Towers, Perrin I can only suggest that the Planning Commission get back to basics in regard to the potential mess on SR 1 (Lewes to Dewey). ACTION is now needed.
On Rt. 9 south at 5 Points a sign says right lane ends, merge left. Why isn't there a sign on the west side stating right-turn lane only. Why isn't' there an eye-level sign stating no left turn instead of an arrow 8' or 10' high on the post? What will you do when MD makes 404 a dual highway? Why does DE allow passing on the right? Long letter describing traffic problems.
Traffic is terrible. We need to put a moratorium on building developments and businesses and restaurants.
Your efforts are appreciated!
No circle in Rehoboth
First choice elimination of traffic lights at 5 Points by use of an overhead cross over and roundabout (example Kent Island, MD, and Davidsville, MD). This will take care of local traffic. Another big reward for the beach traffic with no congestion or slowdowns to keep a good traffic flow without backups. 2nd
Summary of letter - runs a business in RB - now there's an am and pm rush hour in winter - timing of lights is bad - band-aid fixes: rerouting to existing side roads, timing of lights, activity centers - people are going to move away - answer is a bypass around Nassau bridge area that comes back to Rt. 1 in Bethany, where 80-90% of traffic is going - better to purchase farmland now rather than houses later
SR 1 needs to be made a limited access highway with grade separations with interchanges at strategic points & parallel access roads to separate the through & local traffic. Compares Milford, Route 50 in MD - two overpasses with interchanges & parallel access roads on each side. At a minimum, Route 1 needs grade separations at Routes 9 and 24 and the entrances to Rehoboth Beach and Dewey Beach
Summary of letter - model of what is needed is US 50 through Annapolis-Kent Island area. Make SR 1 limited access (2 lanes each way), with two-lane access roads on each side and grade separations at the major crossings (9, 24, Rehoboth Beach entrance). Grade separations at 16 and Dewey Beach
The right turn on red/yield lanes need to be controlled. Allow right turns only on green with traffic.
Stop seeing Rt. 1 as a throughway. The grid plan will cause people to be trapped in their communities. The 3rd southbound lane of Rt 1 from Rt 9 to Rt 24 is desperately needed. Use more traffic signals from Rt 9 to Rehoboth. Allow higher density AR-1 zoning, i.e.., 50 buildable acres=100 units
Have seen some modest plans of traffic solution tonight. Hope to see more!
Have to go to SR 1 for everything
The alternate roads (Plantation & Airport) are becoming clogged on weekends
Too much traffic at intersection of 274 & 275
Bypass needed in Rehoboth
Need other roads
Limit access on SR 1
Need other routes to Bethany, Fenwick, etc.
Signal timing at Rt. 24/SR 1 is a problem. The intersection could be made a right-turn only and the signal eliminated.
The intersection at 5 Points should be phased for a protected left turn.

Why can't they improve the two roads that go under the canal at Rehoboth instead of sending all traffic on 1A?
Is DelDOT going to limit access to Shady Road at Home Depot/Grotto?
Rehoboth needs a parking garage.
Rt. 113 should handle traffic bound for southern beach area; not SR 1.
Why is the bike path at the Village of Five Points not along the railroad property?
Beebe Medical Center would like to see grid line moved to hedge line at rear of its property.
Too much money is being spent on bike paths.
Need a grade-separated interchange at 5 Points - need to do this now before all the development takes place.
Need multiple access points to serve the park-ride lot.
Bikes should not be allowed on SR 1 during the summer.
Need better traffic controls to allow access from side roads. Need police at intersections during the summer.
Proposed grid is terrible
Should have included access roads for outlets
No circles!
Address the fact that those who live in Sussex County and pay taxes have the right to get into and out of their developments (Wawa light) without having to wait for 3-4 lights because too much time is given to traffic going north and south. People are running the lights coming across because not enough time
Adjust traffic light timing to help traffic movement not hinder it on Rt 1. Recently in light traffic no fewer than seven lights were red between Rt 9 & Dewey. Provide limited year-round bus service.
The recent land use scenarios are a flagrant misdirection of what this group must be focusing on - our primary concern should be solving problems on Route One! And what can the SR 1 PAC offer to improve conditions. I believe a long term (5 yrs) vision is important but we must face tactical solutions right now. Instead of these meaningless "land use scenarios" we should be focused on 1) removing all unsignalized left turns on Route One, 2) no third lane from Nassau to 24 or at least to Rolling Meadows, 3) fix critical intersections: Postal Lane & Plantations, Shady Road, 5 Points, 4) redesign Wescoats Road interchange to deal w/ Home Depot & Villages of 5 Points, 5) DelDOT must stop invoking grid concept to P&Z & County Council when approving or using it as an incentive to approve development - also DelDOT must stop offering solutions to developers when DelDOT denies an application! 6) close as
letter summary - found our brochure amusing - thinks activity centers are a joke - maybe border the beaches and make them available to home owners and others from Memorial Day to Labor Day - too much development
I applaud the efforts despite comments by people who complain about what wasn't done rather than try to look at what can be done. This land depends on the recommendations being followed through with and being feasible, which was not presented as to whether this was the case. Another question is whether the new road would simply divide the backup so that instead of all being on Rt. 1, some of it would be on 24. But the same total traffic would exist and the congestion would focus from the Rt 1/24 intersection to Rehoboth, instead of on Rt. 1 from 5 Points to Rehoboth. Perhaps a better long-term option would be one where all the traffic aiming south of Dewey Beach were routed around the whole Lewes/Rehoboth/Dewey area, thus actually removing
Your studies, projects, etc. NOT IN MY LIFETIME! We need traffic now! Get the limited access Rt 113 & bypass!!
Due to congestion for Plantations, Sandy Brae, etc., developments, we suggest that Rt. 275 be left alone except for routine maintenance. Any enhancements to that route would only encourage use by visitors to avoid the lights and outlet traffic on Route 1.
I live on Plantations Road and strongly object to widening it. I do not feel increased traffic in my backyard will help in alleviating traffic problems. I support a brand new road proposed north of 5 points and west of Rd 275, merging south of Rt 24. i.e., Alternative 3A or B.

A few years ago there was a great deal of publicity about a new control system for traffic signals on SR 1. **Summary**: never happened. Has to wait 3-4 cycles to made a left turn from SR onto Postal Lane. After a ferry arrives, can take 3 cycles to get off Kings Highway onto SR 1 southbound. Any workable long-term solution must include a new limited access highway similar to the Dover bypass. How about trying to get the outlets to provide a free tram-train (similar to those used at large amusement centers) to move shoppers between the various outlet complexes?
The right-lane turn area should be extended so cars preparing to turn could get out of the main roadway farther back. More cross roads should be constructed so people could get off Rt. 1 more quickly.
The devastation to homeowners along Plantations Road far outweighs the benefit of moving cars off Rt. 1 for just 2-3 miles. The cost of land and the hardship does not make sense at all.
I think we need to hurry up and do something. The longer we wait, developers continue to build on Plantations Road and other areas, so close to the existing roadway I wonder how any road is going to be widened. Just hurry and do something, the traffic is unbearable and extremely dangerous. Look at all the accidents! Please widen route 1 to 3 lanes by the Wawa as well.
In pedestrian improvements, would providing elevated pedestrian crosswalks be of benefit to minimizing cross over traffic. Particularly at spots where there are malls on both sides of Route 1.
I have a problem with access to Rehoboth Beach and the traffic through Dewey Beach.
Long-term I think you need a bridge across the bay from 24 to Ocean View area to pull traffic away from going through Dewey. We also need access from the area of Cape Henlopen to Rehoboth east of Route 1 to reach Rehoboth Beach areas. Rehoboth Avenue & 1B area not enough.
Why didn't you get peoples' email addresses and save printing & postage costs?
If you use Alternative #3, please also do the Plantations Road and its intersection into a four-lane operation - concurrent with the "new" road.
I understand this study has been going on for some time. It needs to start construction on some of the issues. Something needs to be done now. The biggest problem is growth and all administration should get together and restrict this growth. Until we get the road and the traffic fixed, all commercial and residential building must be stopped. Developers are not concerned with the infrastructure, only with their own interests.
What a joke! The problem has been <u>overdevelopment!</u> The solution is no more development. You propose more development. The activity centers won't work because the destination will still be the beach. The new road you propose dead ends. This won't work.
Speed limit is not coordinated with lights. XXX roads being used as thoroughfare. No speed control.
Change signal at Postal Lane and Rt 1 to allow left turns and through traffic to go at the same time the way all the other intersections are set up. Will the bike lanes be available for mopeds?
When are we going to solve the problem of Rt. 1. As hard as you may have worked for 2 years, you have not given us any real solution. You have offered no dates for implementation of this plan. This meeting, which drew a sizeable crowd, wanted to hear good reasonable proposals. You did not offer them.
Reduce the speed limit on SR 1 to 30 mph from Rt 16 thru Dewey. Announce it before the 113/1 split and I guarantee you much more traffic will use 113. This is not a joke. I am not kidding.
Alternative #2 seems to be the most logical of what is being presented, considering the cost of purchasing land, less impact on existing developments, etc.
All thru traffic is eliminated by the thru lanes and local traffic may go about their business without additional roads.
Staff not prepared! Should always have the CTP sheets and know projected costs. Not recognizing the concern and angst people in our area have.
All development and building must be stopped permanently. This should allow use of all existing properties. There are many business locations constantly turning over or being rebuilt. The death rate should control the availability of residential properties. The roads, even with the plans, may require more land, and I think the takeover will be costly and infringe on current land owners. And who knows whether new roads will correct the problem if

SR 1 Land Use Transportation Study
Issues/Comment Log

Please use the studies also to widen the routes 24 and 9 - only from Love Creek - what about the nest - Also and I know it doesn't include Route 1 Int(?). Please preserve the wetlands and the sand dunes from Dewey to Fenwick. Thank you - God bless. Don't let money ruin our dunes and wetlands.
Crosswalk for pedestrians going from one outlet to another - are they in the plan. Some people dash across the road in almost suicidal fashion.
Mass transit down Rt 1 to end of Ocean City. Park-and-rides along the way.
The only way to successfully impact the traffic on Rt 1 south from Dover to Rehoboth to the Delaware line will be to continue the Del Route 1 bypass to at least Bethany Beach - a new road with limited access. You all know it - you just don't want to spend the money and time.
Construct pedestrian overpasses at strategic locations over SR 1; consider slowing down short-term growth and zoning requests pending the completion of infrastructure improvements, i.e., sewers, road improvements; don't allow developers to swap previously zoned property for sites more favorable. This seems to happen frequently using res. for commercial and vice versa.
Five Points is a disaster. It's worse than ever. Don't put in a grid west of SR 1.
That the "Committee" or DelDOT management or County council members walk or ride a bike from Rehoboth Beach to Lewes . . . Experience the terror.
No new roads for the east side of the County that will take working farmland . Our communities can only hold so many people. Rehoboth is full with no
phone call: Thinks electric trolleys or trains would be a boon to Sussex County because they are environmentally friendly. Thinks the comparative speed and comfort advantage of a train would sway many non-transit users to try a rail vacation to the beach. Noted that many who commute from Sussex to